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Preface

THIS will, I hope, be the first volume of a short history of the Royal Air Force from its beginning as an air battalion in 1911 to its apotheosis in 19—? when this war ends. The present volume takes the story to the 3rd September 1939. I did not feel it possible to go further at this moment, for many reasons. One will suffice. While we are still fighting it is not possible to obtain sufficient material to write with full knowledge of the facts; our own strategic plans must remain secret and, moreover, the enemy's side of the picture is not available.

Any one familiar with *The War in the Air* (Volume I by the late Sir Walter Raleigh, Volumes II to VI by H. A. Jones, Oxford University Press) who reads this book will have no difficulty in discovering the source of my inspiration for the first seventeen chapters. Those six volumes form in every sense a monumental work and will always, I think, be the first and last authority on the Royal Naval Air Service, the Royal Flying Corps, and the Royal Air Force up to the 11th November 1918. I owe a very great debt to the authors, whose researches were minute, whose accuracy was absolute. To the serious student of air warfare their work is indispensable.

The other main sources of information I have used are set down in the short bibliography at the end of this volume.

In writing it I have been helped and encouraged by many busy men who have not hesitated to give me much of their valuable time. To them all I tender my grateful thanks: to Marshal of the Royal Air Force Sir E. L. Ellington, G.C.B., C.M.G., C.B.E., and to Air Chief Marshal Sir B. E. Joubert de la Ferté, K.C.B., C.M.G., D.S.O., who very kindly placed some valuable notes and diaries at my disposal; to Air Commodore H. Peake who encouraged me to write the book; to Mr. C. G. Caines, C.B., O.B.E., who read the manuscript chapter by chapter as it was written and gave me without stint the benefit of his great knowledge of the Royal Air Force and of his ripe judgement of men and public affairs; to Mr. Cecil Day Lewis for the poem on page xii; to Miss Sybil Brown who carried out much useful research; and lastly to my friend John Nerney, the librarian of the Air Ministry, whose encyclopaedic knowledge, keen criticism, unerring judgement, and never failing good humour sustained and supported me throughout my task.

On one point I should like to be very clear. This book is in no sense an official history. I have been privileged, through the kindness of the Air Ministry, to see certain reports and other

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R.A.F. — THE ANCESTORS

Inventive men, haunted by images
Of flight, they worked in power and stress to learn
The swallow's long endurance, the pacific
Gliding of gulls, the plover's looping turn.

Audacious men, they clothed their vibrant vision
With wood and linen, flew it in the teeth
Of gravity, and like enchanters held
A fragile art between themselves and Death.

Air-worthy men, sons of an element
That speaks in light and lifts the venturer high,
They traced a buoyant span from shore to shore
Or fell like sunbursts from the embattled sky.

Their spirit rose in fine pitch off the field
Of earth, taking a steep way to the stars:
History flew beside them, and bright fame
Arches her wings above their cloudy wars.

C. D. L.

1. Dedication to Flight

ON the 19th August 1911 Lieutenant H. R. P. Reynolds of the Royal Engineers was flying a Henri Farman bi-plane from Oxford to Cambridge where that year's army manœuvres were about to take place. The evening was warm and fine but in the perfectly still air there was a suggestion of thunder. 'I scarcely had occasion to move the control lever at all,' said Lieutenant Reynolds in his report, 'until I got to Bletchley where it began to get rather bumpy; at first I thought nothing of this, but suddenly it got much worse, and I came to the conclusion it was time to descend.' In the circumstances, the decision was not without prudence. A high, black thunder-cloud was moving up on the starboard quarter of the aircraft which was at that time flying at about 1,700 feet, if the barometer, with which it had been somewhat hastily fitted, was accurate, a matter of some doubt. Following the technique of those early days, the pilot switched off his engine and began to glide towards the chequered fields beneath, among which he hoped to find a good landing-ground. 'Almost directly I had switched off,' he reported, 'the tail of the machine was suddenly wrenched upwards as if it had been hit from below and I saw the elevator go down perpendicularly below me. I was not strapped in, and I suppose I got hold of the uprights at my side, for the next thing I realized was that I was lying in a heap on what ordinarily is the under surface of the top plane. The machine was in fact upside down.'

Somewhat bewildered, Reynolds got to his feet and, standing on the inside of the plane, held on to a strut and awaited developments. They were not long in coming. At first 'the machine just floated about, gliding from side to side, like a piece of paper falling'. After some minutes, however—how many the pilot did not know—the machine overswung and momentarily righted itself; but before he could climb back into the cockpit, it 'had turned over upside down again and restarted the old floating motion. We were still some way from the ground.' Lieutenant Reynolds had now had time to note that the aeroplane seemed intact, for the tail was at the end of the fuselage and all the controls appeared normal. Unfortunately, they failed to control. The machine continued to swing from side to side and 'I made up my mind that the only thing to do was to try to jump clear of the wreckage before the crash'. In pursuance of this plan, he jumped when the machine was only ten feet up and fell heavily to the ground, fortunately without hurting himself. He rose to his feet to confront the first witnesses of the accident, two men who had been

bathing in a nearby river. They were stark naked. 'About fifty or sixty people soon collected and some time passed before it occurred to anyone to remark that these two men had no clothes on.'

This was one unrehearsed incident of many which took place during those army manœuvres, the first in which aircraft took part. Some seven months later those aircraft formed the nucleus of the Royal Flying Corps, but at that time they were the most precious items of the miscellaneous equipment allotted to the Air Battalion of the Royal Engineers, a formation which—*absit omen*—had been formed on the 1st April of that year. It was to enjoy a bare twelve months of existence before giving place to the Royal Flying Corps, but during its brief life it numbered among its officers men whose distinction in the field of aviation can never be questioned.

Larkhill on Salisbury Plain was its station and it was equipped with a variety of aircraft, none of them airworthy by the standards of to-day, and not all of them able to take the air even in the most favourable circumstances. They consisted of 'an antique Wright which had originally belonged to C. S. Rolls; a somewhat antique and very dangerous Blériot; "The Paulhan", a type no longer sold by Paulhan, a De Havilland, a Henri Farman, four Bristols, and a Howard Wright'. The pilots flying these contraptions numbered fourteen and they formed No. 2 Company of the Air Battalion, the officers and men of No. 1 being detailed for service with balloons and dirigibles. Of these fourteen officers, eight belonged to the Royal Engineers, who had held the monopoly of the air for more than a quarter of a century. The remainder came from other regiments of the British Army and were therefore, in the regimental sense, interlopers. Their instructor was Mr. G. B. Cockburn. He had previously taught to fly, at Eastchurch, the first officers of the Royal Navy who had attempted to acquire such an experience, and was himself closely connected with the pioneers of British aviation. Before probing any deeper into its history, a word concerning the activities of these men is necessary in order to explain the origin of what was to become the most powerful, the most efficient, and the most expert Air Force the world had seen.

Although the first aviator's certificate was granted by the Royal Aero Club of the United Kingdom to Mr. J. T. C. Moore-Brabazon (subsequently Lord Brabazon of Tara) in March 1910, the history of British flying in heavier-than-air machines goes back several years before that date. On the 24th January 1906 the Engineering Supplement of *The Times* contained a letter from a Mr. Alliott Verdon-Roe stating the writer's absolute belief in the claim made by the American brothers, Orville and Wilbur Wright, to have flown twenty miles and adding that, if he were able to

construct a full-size machine on the lines of the models which he had already made and successfully flown, it would be possible for him to perform the same feat. The comment of the Editor on this claim was definite enough. 'It is not to be supposed,' he wrote, 'that we can in any way adopt the writer's estimate of his undertaking, being of the opinion, indeed, that all attempts at artificial aviation on the basis he describes, are not only dangerous to human life, but foredoomed to failure from an engineering standpoint.' Seldom has an expert delivered himself of an opinion more utterly and entirely erroneous, but at that time it seemed a sober statement of inevitable fact. It took, however, more than the considered views even of *The Times* engineering expert to discourage Mr. Verdon-Roe and he continued his quest of the secret of flying, despite financial difficulties of the severest kind. A prize of £2,500 had been offered by the authorities at Brooklands for the first aviator to fly round their track before the end of 1907. Mr. Verdon-Roe was not able to compete for this, since the machine which he had constructed in a shed set up at Brooklands lacked motive power, and it was not until the early months of 1908 that he was able to borrow a 24 h.p. 8-cylinder Antoinette engine weighing 98 lb., not including the radiator. Before he could install it in his machine the motor-racing season was upon him and he was given notice to quit. After some negotiation, the manager of Brooklands, a Mr. Rodakowsky, 'allowed me to stay provided that I moved my shed . . . and painted it dark green, which I did'. He was not, however, permitted to sleep in it beside his precious aeroplane, and in order to do so he was constrained 'to bid the gate-keeper good-night, pass out, and later climb back over the fence and return to my shed'. It was also necessary for him to make his trials very early in the morning when there was little wind and when no racing car was likely to be using the track.

Mr. Verdon-Roe lived the simple life. His expenditure on food averaged five shillings a week and his diet consisted of dates, kippers, bacon, and half a pound of rump steak. Undaunted, even when Mr. Rodakowsky, assisted by the attendants at Brooklands and the local police, picked up the aeroplane and put it on the other side of the fence lest it should 'offend motor-racing patrons', Mr. Verdon-Roe continued his experiments, and at last, on the 8th June 1908, he took the air, the first Englishman to fly in an all-British-built machine. The distance he covered was about one hundred and fifty feet.

While he was thus engaged at Brooklands, Colonel S. F. Cody, an American, who subsequently became a naturalized Englishman, was at work in the balloon factory at Farnborough building a biplane of his own design. His chief was Colonel J. E. Capper,

TRIALS OF A PIONEER

R.E., who had become Superintendent of the factory in 1906. At that time he was still interested mainly in the construction and development of balloons and airships, some account of which will be given in the next chapter. Colonel Capper, however, neglected nothing which might further the cause he had at heart, the endowment of the British Army with the means of flight. As far back as 1904 he had gone to North Carolina to persuade the Wright Brothers to continue their experiments in England, but he and they had been frustrated by the Treasury, which refused to sanction the expenditure involved.

Colonel Cody himself was similarly thwarted. He was chief instructor in 'kiting', but it seemed to him that if an engine were fitted to kites of an improved model, flying might become possible. All through 1907 he laboured, hampered almost as much by Treasury control as by the complexities of the problem he sought to solve. Moreover, private firms, brought in to aid the Government factory, were dilatory, stupid, or merely unbusinesslike. 'A telegram sent to you,' writes Colonel Cody to one of them on 15th March 1907, 'at the telegraphic address you print on your memo forms, was returned by the Post Office stating that the address was insufficient. A further telegram had, therefore, to be sent you with your full address thereon. In the circumstances I should be glad if you will kindly remit me the sum of ten pence (10d.), the cost of the original telegram.'

His own position was insecure. Receiving only a few hundreds a year he sought for months to obtain permission to pay income tax at the more favourable rate of ninepence as contrasted with one shilling in the pound. His failure to fill in the proper form, however, proved his undoing and his application was disallowed. To financial difficulties were added others of a more technical kind. 'I have tried the "Antoinette" engine several times,' wrote Cody to a friend in the spring of 1907, 'and find the exhaust pipes get red-hot after it has run thirty seconds to a minute. Will you kindly ask the "Antoinette" people what is the cause of this.' His difficulties with his engine are typical of those encountered by all the early experimenters in flight. Those early years, indeed, are haunted by inventors, from Sir Hiram Maxim onwards, who had solved, at least partially, the problems of the shape and angle of wings, only to be defeated by the difficulty of finding an adequate and reliable motive force with which to propel them through the air. Colonel Cody persevered, and by 1908 was making many experimental flights over Laffan's Plain. It was over this wide stretch of Wiltshire that he was killed in August 1913 by the breaking of his machine in mid-air.

Another pioneer was Lieutenant J. W. Dunne of the Wiltshire Regiment. His first experiments were carried out even earlier

SECRET EXPERIMENTS

than those of Cody or Verdon-Roe, for he began the study of mechanical flight in 1900 after being invalided home from the Boer War. He was encouraged by Mr. H. G. Wells, and later, in 1903, by Sir Hiram Maxim, who attached a number of 'surfaces' or 'planes' to a long arm fixed to the mast round which his own 'flying boats' were whirled. The arm was rotated at speed about the mast and Dunne clung on 'rather like a monkey' to one of the planes and 'did in this fashion the first timed 100 miles per hour in history'. He, however, refused 'the offer of a job'. This was in 1904 and by that time he was already beginning to experiment with models built on the principle of the soaring bird.

Two years later the War Office was sufficiently interested to extend some encouragement to his experiments. Financially he was a trifle more fortunate than Colonel Cody, for the Treasury, moved by the statement that his services 'which are of a highly scientific nature, are rewarded at present with merely the wages of an ordinary unskilled labourer', allowed him half a guinea extra a day whenever he was actually at work. On one point the authorities were adamant: everything was to be done in the strictest secrecy. Dunne was forbidden to wear uniform and was shown in the Army List as an invalided officer on half pay.

By the end of 1906 it seemed probable that, if his experiments were successful, he would be able to produce an aeroplane which would be inherently stable and, therefore, able to fly in almost any conditions. His glider was constructed piecemeal in the shops of the balloon factory at Farnborough and put together by himself and an assistant in a locked room. When his machine was finished, Haldane, then Secretary of State for War, induced the Marquis of Tullibardine, heir to the Duke of Atholl, to put the lonely grouse moor overlooking Glen Tilt, near Blair Atholl, at the disposal of the inventor and his assistants. In 1907 a small party in plain clothes, afterwards the nucleus of the Aeroplane Section of the Air Battalion, arrived at this out-of-the-way spot and set to work. The machine they used was fitted with two Buchet engines, which together developed less than 15 horse-power. In spite of the dictum of the War Office that 'a machine which could not fly with 15 horse-power, was of no use to the British Army' it failed to fly. Undismayed, the inventor and those with him, removed the engines and used the aeroplane, known as D.1, as a glider, painting white stripes on the wing surfaces to disguise 'their curvature from prying eyes'. D.1 was thus the first aeroplane to be camouflaged. The intrepid Marquis caused himself to be tied to it and taken to the edge of a cliff some 2,000 feet above sea-level. 'Just before starting I looked down and saw a white spot beneath me . . . it was a doctor spreading out a

LIEUTENANT DUNNE PERSEVERES

ground sheet and getting his appliances all ready, but an all-wise Providence blew the machine right over and we never started.'

By that time the Press and the German Intelligence Service were in full cry after 'the mystery of the moors'. They were dealt with firmly by the Duke of Atholl, who, entitled by ancient statute to maintain an army of his own, set a cordon round the area of experiment. Inquisitive strangers were headed off, but a German Intelligence Officer was allowed to steal a model, since it was one of a machine which had already proved a failure. Reporters were dealt with more firmly and one of them confessed that he had no stomach for returning to the place as it 'was surrounded by savages'.

This was in 1907. In 1908 Dunne produced another machine, the D.3, also built at the balloon factory, but was unable to obtain sufficient linen to cover both sides of the plane; the War Office would not permit such extravagance. He also built a man-carrying glider so that the pilot might become familiar with the aircraft before attempting to fly a power-driven model. Dunne's ill-health did not permit him to fly the glider, which was taken up many times by Captain L. D. L. Gibbs, Royal Field Artillery. He made many successful glides, notably one of forty-four yards on the 9th October, but eventually caught his foot in some gorse and fell right through the centre of the machine, and that was the end of it. The power-driven aeroplane was not successful, again because of the bad performance of the engine, an R.E.P., and in the autumn of that year the experiments came to an end. The attitude, at that time, of the War Office towards the military use of aeroplanes is well illustrated by a talk which Dunne had with two leading members of the Army Council. To his statement that aeroplanes could not maintain themselves in the air at speeds of less than forty miles an hour, one of the two replied that it was impossible for any one moving at such a pace to see anything at all. The other, thumping the table, said, 'That is exactly my opinion.'

The distinguished generals were not alone in their view; for early in 1909 Cody and Dunne were informed that 'the War Office had decided to cease making any experiments with aeroplanes as the cost had proved too great'. It had amounted to £2,500. At that period Germany was spending about £400,000 on military aeronautics.

Meanwhile, Mr. Verdon-Roe, dismissed from Brooklands, had emigrated to Lea Marshes, where he rented two railway arches in which he installed a new triplane. Being almost at the end of his financial resources he was compelled to part with his 24 h.p. Antoinette engine and to make do with a 9 h.p. J.A.P. motor-cycle engine. Even with this low horse-power he began to make

encouraging progress. 'By this time,' he says, 'I had gathered around me a faithful band of assistants, or perhaps I should call them fellow adventurers. . . . By all Trade Union conditions I would have been termed an employer of sweated, ill-paid labour, but no one seemed to mind; it was only the job that mattered.' By July 1909 his triplane—it can now be seen in the Science Museum, South Kensington—was making flights of three hundred feet and more. How it did so is best described in his own words: 'We endeavoured to start up the engine, a task which usually took at least a quarter of an hour. When it was started and warmed I would give the signal "Let go", and the machine then tore over the ground, followed by my helpers carrying tools, pieces of timber, and other necessary appliances to cope with the repairs necessary after the almost inevitable crash.' One of these flights was witnessed by a young lady on her way to the River Lea, into which she intended to throw herself. The sight of this strange contraption buzzing perilously six or ten feet above the ground deterred her from her resolution; and she wrote to the inventor offering to take his place in the aeroplane and thus save his life at the probable expense of her own. With great tact, Mr. Verdon-Roe replied that he would allow her to do so when he had perfected his invention. Soon afterwards he was pursued by a bailiff, put upon his track by the local authorities for disturbing the neighbourhood by his experiments. His habit of early rising proved a great trial to the representative of the law who, however, eventually caught him red-handed. Very fortunately for Roe, a day or so later Blériot flew the Channel and the resulting kudos acquired by aviation was such that the local authorities did not venture to bring into Court one of their own compatriots charged with the crime of trying to fly his own aeroplane.

Late in 1909 Major Lindsay Lloyd, a more enlightened manager to Brooklands, converted the open space enclosed by the track into an aerodrome. The English, who usually start late, but who have developed a habit of finishing well in front, were at last beginning to take an interest in aviation. Inspired by the feats of foreigners such as Paulhan, Blériot, and Farman, and by their own compatriot Grahame-White, a number of young men established themselves side by side with Verdon-Roe at Brooklands, which soon became the experimental ground of the British aircraft industry. By the spring of 1910 they were to be seen running about in aircraft of their own invention in an endeavour to get up sufficient speed to rise into the air. Besides Verdon-Roe, the British and Colonial Aeroplane Company, founded by Sir George White of Bristol, which subsequently became the famous Bristol Company, was there established, followed soon afterwards by Martin Handasyde, the Scottish Aviation Company, Mr. J. V.

A HAPPY BAND OF FANATICS

Neal, Mr. D. G. Gilmour, and Mr. F. P. Raynham. Mrs. Hewlett, the wife of Maurice Hewlett, the novelist, set up an Aviation School at Brooklands and, among others, taught her son to fly.

The meeting-place of this community, composed for the most part of fanatics with comfortable incomes, prepared to live on thirty or forty shillings a week in order to devote the remainder to aviation, was the 'Blue Bird' restaurant. Here the pioneers met for food, drink, and argument. 'Living as they did for ends of their own and apart from the great world, the brotherhood naturally took pride in themselves as a chosen people dedicated to high purposes.' Their efforts, and those of others, were fostered by the Aero Club of the United Kingdom, which had been founded as far back as 1901 by Mr. F. S. Hedges Butler, assisted by the Hon. C. S. Rolls, an early pioneer and founder of the Rolls-Royce Company, whose engines thirty years later were to win the Battle of Britain. He lost his life flying a Wright biplane on the 12th July 1910. From 1910 onwards the Aero Club issued flying certificates, which the Government subsequently recognized as a warrant of proficiency. Among the first hundred to whom the Club granted them were Mr. T. O. M. Sopwith and Mr. Geoffrey de Havilland. Mr. Sopwith built his first aeroplane in 1911. It was bought by the Admiralty, and with the money thus obtained he established himself at Kingston where he built two more machines, one of which was successful. The other, a flying-boat, was destroyed in its trial flight. From his land aircraft there were subsequently developed those famous varieties of single-seater biplane scouts, the 'Tabloid', 'Pup', 'Camel', and 'Snipe', which did so much to secure mastery of the air for the Royal Flying Corps and the Royal Air Force in the war of 1914-18. In the war which began in 1939 the company he founded achieved the Hawker Hurricane without which the Battle of Britain would not have been won.

Mr. de Havilland built his first machine in 1910, and in December of that year became a member of the balloon factory at Farnborough. He was responsible for the famous D.H.4 and D.H.9 and, a generation later, together with his sons, for the even more famous Mosquito.

It was in 1911, too, that Mr. Eustace and Mr. Horace Short, makers of motor-boats, began to take an interest in aviation. They established themselves at Sheerness on the marshes of the Isle of Sheppey, and it is to them that so many of the seaplanes used by the Royal Naval Air Service and subsequently by the Royal Air Force in the Four Years War are due. Their names will be ever associated with the moderately successful Stirling and the very successful Sunderland flying-boat. It was on one of Horace

EASTCHURCH, HENDON, LARKHILL

Short's machines that, in October 1909, Moore-Brabazon flew the first circular mile ever covered by a British aeroplane and he flew it close to Eastchurch where the Aero Club, thanks to the generosity of Frank McClean, had established what very quickly became the scientific centre of British aviation. Here, such men as Ogilvie, Percy and Cecil Grace, the Hon. Charles Rolls, and G. B. Cockburn, carried on their strange and fruitful activities. As has already been recounted, the last-named, who was the sole representative of Great Britain at the famous Rheims Aviation Meeting of 1909, taught the first four commissioned officers to be allowed to learn to fly. They were Lieutenants C. R. Samson, R. Gregory, and A. M. Longmore of the Royal Navy, and Captain E. L. Gerrard of the Royal Marine Light Infantry. Both pupils and instructor were enthusiastic though their activities were somewhat hampered by the weight of Cockburn, whose fourteen stone, together with the weight of the pupils, proved a heavy burden for the 50 h.p. Gnome engine of the aeroplane. It was rarely able to attain a height of more than thirty feet.

Aerodromes were now beginning to appear in other places. Besides Brooklands, there was also Hendon—developed by Holt Thomas—and Larkhill on Salisbury Plain, a few miles from Amesbury. But the Government, still slow to appreciate the importance of the new science, continued to lag behind. In 1911 Holt Thomas founded the Aircraft Manufacturing Company and engaged on a campaign to prove that a national air force was not a luxury but a necessity. He, and others with him, can justly be awarded a share in the foundation of the Royal Flying Corps, the Royal Naval Air Service and, subsequently, the Royal Air Force.

While Eastchurch saw the beginnings of naval flying, Larkhill saw those of military. Captains Fulton and Dickson of the Royal Field Artillery, whose ruling passion was 'not sport but patriotism', began to develop flying at their own expense near Bulford Camp. In the autumn of 1910 Captain Dickson, who had then joined what was subsequently the Bristol Aeroplane Company, appeared at army manœuvres in a Bristol biplane. Here he encountered the hostility of cavalymen who saw dimly in his strange, lumbering machine an indication that one day their occupation would be gone. A few weeks after the manœuvres Dickson was the victim of a collision at an Aviation Meeting at Milna. He never really recovered from the injuries he then received and died in September 1913.

Associated with Dickson and Fulton was, again, Captain Gibbs who, after the experiments with the Dunne aeroplane, learnt to fly in France. After they had been at Larkhill for some time the indefatigable Cockburn arrived fresh from teaching the naval officers to fly at Eastchurch. He at once began a similar task at

TRAINING ON PRIMITIVE MACHINES

Larkhill, his first pupil being Fulton. By the end of 1910 the Bristol Company was formally established on this airfield with three instructors—Jullerot, one of the best of French pilots, Gordon England, and H. Busteed of Australia. The Bristol machine proved an excellent trainer and Salisbury Plain probably the best place in England for training in flying. It also possessed the advantage of being that part of the country where the Army is most accustomed to manœuvre, and presently the hard, unremitting work at Larkhill began to have an effect on the soldiers. Hard work it most certainly was. Speaking English with a strong Wiltshire accent, Jullerot, who had taught himself to fly on a Henri Farman in 1909, imparted his knowledge to more than four hundred pupils before 1914. Very many of them subsequently saw service with the Royal Flying Corps. Fewer than half of one per cent failed to qualify, and the quickest to learn were sailors and cavalymen. The method of teaching was, by the standards of a generation later, primitive to a degree. The average height at which the Bristol box kite flew above the level plain was not more than thirty feet and its average speed not above fifty miles an hour. The pupil sat behind and slightly above the instructor, clutching his body with his knees and with feet dangling in the air. The control column—some years were to pass before it became universally known as the 'joy-stick'—was on the right. Thus both men could put a hand upon it, but the rudder bar remained beneath the instructor's feet. When he was of opinion that his pupil had mastered the art of keeping the leading edge of the elevator parallel to the horizon, they changed places. Turns were always made in the first instance to port, for by so doing the maximum amount of assistance would be obtained from the 50 h.p. Gnôme engine which revolved anti-clockwise. At last the day came when the pupil was judged capable of flying alone. This was the supreme moment. In front of the sheds at Larkhill the ground ran level for some hundreds of yards; then came a shallow dip marked by a clump of trees. It was about a quarter of a mile across and at most twenty feet in depth. The aspiring pilot ran his machine at full throttle to the near edge of the depression, arriving at which it automatically took the air, to alight equally automatically on the farther edge. The next stage was to practise turns in both directions until finally the correct performance of a figure of 8 assured the award of the coveted 'ticket'. It should be remembered that the machines of those days were of the most primitive kind. They could fly only in comparatively calm weather; they were unprovided with any instruments save a switch with which to turn the engine on or off, and a primitive gadget for calculating the revolutions of the uncertain engine by counting the drips from an oil filter. The strains and stresses to

which might be subjected the wooden framework and the wings covered with linen tautened by a dope made of flour and arsenic mixed, were unknown and therefore unsuspected. All these hazards had to be added to that of learning to fly.

On the 28th February 1911 an Army Order—to come into effect on the 1st April—created the Air Battalion of the Royal Engineers. Henceforward flying was no longer the hobby of individual officers or civilians. It was now part of the duties of the Army. The battalion, under the command of Sir Alexander Bannerman, was divided into two companies—the first concerning itself with airships, the second with aeroplanes. No. 2 Company was placed under the command of Fulton. From this modest official start grew the Royal Flying Corps.

The Admiralty, at first concerned more with airships than with heavier-than-air machines, was a few months behind the War Office. The result, however, of the experiment of teaching three naval and one Royal Marine officer to fly was the establishment, in December 1911, of the first Naval Flying School on ten acres of land next door to the grounds of the Royal Aero Club at Eastchurch. The pupils of Cockburn, together with twelve naval ratings, formed the staff. From this even smaller beginning the Royal Naval Air Service developed. The history of this Service and of the Royal Flying Corps have now to be considered. They are the parents of the Royal Air Force.

2. Vehicles Lighter than Air

ONE day in the summer of 1785 a gentleman of the name of Crosbie announced to the inhabitants of Dublin his intention of taking the air in a balloon. At that time this method of flying was still a comparative novelty. The earliest balloon ascent in the British Isles had taken place a year previously, on the 27th August 1784, when a Mr. James Tytler, then editor of the *Encyclopaedia Britannica* at a salary of seventeen shillings a week, ascended at Edinburgh and travelled half a mile in a balloon inflated with hot air. He was followed less than a month later by Lunardi who, in the presence of a crowd numbering nearly 200,000, made a flight over London in a hydrogen balloon. Its destruction a fortnight later drew from Dr. Johnson, then almost on his death-bed, a qualified measure of approval: 'The vehicles,' he said, 'can serve no use till we can guide them . . . the first experiment, however, was bold and deserved applause and reward.'

Mr. Crosbie was in some difficulty; his balloon was small and he himself was large, too large to be lifted into the air. A young Irish officer, Richard M'Guire, who was watching his attempts to leave the ground, jumped into the basket, threw out Mr. Crosbie and the ballast, and 'soared into fame'. He was rescued from the sea and found himself a national hero. Far from taking a harsh view of his exploit, the military authorities commended him and he was the first airman to receive a knighthood.

The French were probably the first to use balloons in war and it is said that one was sent up during the Battle of Fleurus in 1794. Napoleon had no use for them, however, and it was not until 1870 that they played any part in war. In that year the French organized a form of air-mail, sending up from the beleaguered city of Paris balloons loaded with dispatches and occasionally with important passengers, of whom Gambetta was one. The German reaction was typical: Bismarck issued an order that all aeronauts were to be regarded as spies and treated accordingly.

In England, the military authorities began experiments with balloons in 1878, and balloon detachments took part in the army manœuvres of 1880 and 1882. Two years later, a balloon unit attached to the Royal Engineers took part in the Bechuanaland Expedition and created a considerable impression. 'If the first white men,' said a native chief, 'who came into this country had brought a thing like that . . . and demanded that we should worship and serve them, we should have done so. The English have indeed great power.' In 1885 the unit saw service in the

Sudan. By then a balloon depot and factory had been in existence for two years. In 1892 it was given permanent quarters at Aldershot, where a school of ballooning was founded. In 1883 the factory first began to work, and soon had difficulties to contend with. In November of that year, for example, its principal workman was sentenced to three months' imprisonment for assaulting the police, while its employees, the Weinling family, who were said to possess the secret of joining together gold-beater's skin from which the envelopes of the balloons were made, proved very troublesome. One of them suffered from fits and all of them were suspicious and obstructive, being very loath to impart their secret to any one else. Nevertheless, under the energetic direction of Major J. L. B. Templer, the factory presently began to forge ahead and was soon doing excellent work. Balloons made in it played a part in the South African War, notably at the Battle of Magersfontein and the siege of Ladysmith. They appear seriously to have disquieted the Boers and on more than one occasion to have saved British forces from disaster by discovering ambushes and ambuscades. Malta also had her first experience of an air force. Balloons from Aldershot paid a prolonged visit to the island in 1904 but found the conditions difficult, and one of them, called 'Trusty', was found, when unpacked, to have provided sustenance for 'mice or insects'. Captive balloons came fully into their own in the Four Years War, in which the work of the observers, who swung precariously in baskets below their swelling forms, was of the highest value.

In January 1902, having seen what Monsieur Santos Dumont had been able to accomplish in France, Colonel Templer urged that experiments should be carried out in the development of navigable airships. The War Office reduced his vote by half but, despite this financial handicap, endeavours were made to construct elongated balloons to carry an early model of wireless equipment. By 1904 Colonel Templer had got as far as making two envelopes of gold-beater's skin for use in the building of an airship, but it was not until September 1907, when he had been succeeded by the equally energetic Colonel J. E. Capper, that she took the air. Her name was the *Nulli Secundus*. She was shaped like a sausage, was 120 feet long and somewhat less than 30 feet in diameter, and an Antoinette engine of between 30 and 50 h.p. drove her through still air at a top speed of 16 miles an hour. Her first successful flight took place on the 5th October, when she circled round St. Paul's and manœuvred above Buckingham Palace. A headwind, however, prevented her from returning to Farnborough, and having landed successfully at the Crystal Palace she went home five days later by road. In the following year she was reconstructed but was not successful and gave place to the Beta

‘IT IS THE WORK OF A LUNATIC’

which, on the 3rd June 1910, flew from Farnborough to London and back by night, a distance of 70 miles in just over four hours. A new airship, the Gamma, was next built with an envelope of rubbered fabric—Germany had by then bought most of the gold-beater’s skin available—but disappointed her designers. In 1912 the Beta Number 2, which was stiffened with ribs in the nose somewhat after the fashion of an open umbrella, proved more successful. She was followed by the Delta and the Epsilon, which appeared in 1913. By then, however, it had been decided that the Admiralty, which had already conducted a number of experiments, were better suited than the War Office to deal with the problems of lighter-than-air machines.

For naval purposes it was thought that what was needed was an aircraft which could stay aloft as long as possible, be of sufficient size to carry wireless equipment, and remain stationary when necessary. Messrs. Vickers, Son & Maxim were accordingly commissioned to build a rigid airship somewhat on the lines of Count Zeppelin’s machines, which were then in full process of development in Germany. The firm began work in May 1909 in the Cavendish Dock at Barrow-in-Furness, and the construction of the airship continued throughout two years in conditions of the greatest possible secrecy under the general direction of Captain M. F. Sueter, R.N., and Lieutenants N. Usborne and C. P. Talbot. When at last she emerged from the dock to be attached to a mooring mast, she was seen to be 512 feet long, 48 feet in diameter, and to be filled with about 700,000 cubic feet of gas. The framework was made of a new alloy called duralumin; two Wolseley motors each of 180 h.p. were to propel her through the air. They never did so. This great vessel, to which the public gave the somewhat unfortunate name of the ‘Mayfly’, spent four days at her mooring mast and successfully rode out a 45 miles an hour breeze. She was taken back to her shed, but on emerging again on the 24th September 1911 she broke her back when being drawn towards the mooring mast and became a total wreck. The subsequent Court of Enquiry decided that her loss had been due to structural weakness and exonerated every one from blame. The fact of the matter was she was too heavy, though perhaps she did not deserve the harsh comment of a distinguished Admiral who, on beholding her for the first time, exclaimed: ‘It is the work of a lunatic.’

Discouraged by this costly failure, the Admiralty discontinued its experiments and thus, when war broke out in 1914, no rigid airship was available for service with the Fleet. Nevertheless, those who believed in the future of that form of aerial vessel did not despair. In June 1912 the Technical Sub-Committee of the Committee of Imperial Defence, whose swift decisions were in

pleasing contrast with its cumbrous title, sent two of its members, Captains Sueter and O'Gorman to France, Austria, and Germany, with instructions to look into the whole question of airships. In Germany they found no less than thirty, and were given a flight in the Zeppelin airship 'Viktoria Luise'. In their report they stated 'that German airships have, by repeated voyages, proved their ability to reconnoitre the whole of the German coastline on the North Sea. In any future war with Germany, except in foggy or stormy weather, it is probable that no British war vessels or torpedo craft will be able to approach within many miles of the German coast without their presence being discovered and reported.' The truth of this forecast was proved often enough in the war which was to break out two years later.

The Sub-Committee was much impressed by this report but realized that the immediate construction of large rigid airships was an impossibility so long as trained officers and men were not available to handle and navigate them. Their immediate, though only partial, remedy for this situation was to reconstitute the disbanded Naval Airship section and attach it to the airship squadron of the Military Wing of the Royal Flying Corps. It was this squadron which was at that time working with the various airships called by letters of the Greek alphabet. Attempts were made to increase the number of lighter-than-air machines by buying two airships from foreign firms. The Zeppelin Company were forbidden by the German Government to sell any of their products, but the Parseval Company, which produced semi-rigid airships, did not come under this ban and sold one of them to the Admiralty. An Astra-Torres non-rigid airship, was bought from France in 1913, and in that year the First Lord of the Admiralty, Winston Churchill, obtained the Treasury's sanction for the construction of two rigid and six non-rigid vessels. Some of these were to be built abroad, others by Messrs. Vickers and Messrs. Armstrong Whitworth, but, when in 1914 war broke out, Germany and Italy retained the two ships building in those countries and none of the others under construction in Great Britain was ready.

As has been said already, the airship squadron of the Royal Flying Corps was hard at work until the end of 1913 when, not without protest, their airships were handed over to the Navy. Up to that time they had been under the command of Major E. M. Maitland who had had great experience in ballooning and parachute jumping. In 1908 he had travelled 1,117 miles in 36½ hours, landing in Russia; in 1910 he learnt to fly an aeroplane and broke both ankles in a crash, while 1913 saw him leaping in a parachute from the airship Delta. Subsequently he was on board the famous airship R.34, which crossed the Atlantic in 1919, and

AIRSHIPS ON ARMY MANŒUVRES

he met his death on the 24th August 1921 when the R.38 crashed into the Humber.

Before its machines were acquired by the Navy much of the work of the airship squadron was concerned with experiments in wireless telegraphy. These were carried out by Captain H. P. T. Lefroy, R.E. At the army manœuvres of 1912 two airships took part, the Gamma with the defence, the Delta with the attack. On the way to Thetford, the Delta broke down over North London, but her wireless messages reporting this mishap were clearly picked up. The Gamma achieved considerable success, her signals being picked up 35 miles away. Every morning she flew over the 'enemy' at daybreak and within half an hour General Grierson, commanding the defenders, was possessed of the fullest information. The Gamma, however, was not a fast ship. When the manœuvres were over she took three hours to fly 20 miles from Kneesworth to Cambridge, where she 'bombaraded that city of learning with Very lights'. She then ran out of fuel but, by discharging all her ballast, the crew kept her in the air till dawn and made a safe landing near Bristol. The next year, airships again took part in the army manœuvres and proved that it was possible to send wireless messages for a distance of over a hundred miles. When war broke out the value of this advance became apparent and at least two airships, the Astra-Torres and the Parseval, made good use of their wireless when patrolling the Channel above the heads of the expeditionary force. They were the forerunners of the naval 'Blimps' which performed such useful work submarine spotting throughout the war of 1914-18.

3. Birth of the Royal Flying Corps

UNIMAGINATIVE and dilatory though the Government of this country, in the early years of the present century, appears to have been in so far as aviation was concerned, one man at least was alive to the possibilities of the newly developed science. In 1909, two years before the formation of the Air Battalion, Haldane, then Secretary of State for War in Asquith's administration, called on Lord Rayleigh and Dr. Richard Glazebrook, Chairman and Director respectively of the National Physical Laboratory, to draw up a scheme for a scientific inquiry into flight, which should include experiments on a large scale. The scheme they prepared was subsequently submitted to the Prime Minister, who set up the Advisory Committee for Aeronautics. It consisted of ten members, of whom the President was Lord Rayleigh and the Chairman Dr. Glazebrook. On taking over the Farnborough balloon factory, Mr. Mervyn O'Gorman joined this committee, whose main service was the establishment of an experimental department at Teddington for the investigation of aeronautical questions. Problems examined in this laboratory were put to practical tests at the Farnborough factory and such questions as air resistance, the strains and stresses capable of being borne by different kinds of materials, the most efficient shape for aeroplane wings, and many other questions were scientifically investigated. 'There were,' says Sir Walter Raleigh, 'no theoretically quick results, but the work done laid a firm and broad basis for all subsequent success.'

Side by side with the scientists working at Teddington, O'Gorman developed the Royal Aircraft Factory at Farnborough which, when he took it over, consisted of one small machine shop, a shed for making balloons, and one for housing airships. It soon became the chief centre for experiments with full-sized aircraft. This was but natural at so early a stage. The development of the art of flying was then too costly an undertaking for private enterprise to tackle unaided. There was no great demand by the general public for aeroplanes, and private firms would have suffered even more than they did had not the factory at Farnborough encouraged their efforts, notably by refraining from any attempt to produce a standard Government aeroplane engine. Relations, however, between the factory and private enterprise were not by any means harmonious. The Government officials wished to encourage, to supervise, and to co-ordinate; the private makers saw in these efforts an attempt to establish that which they most dreaded, a Government monopoly. The struggle

between the two interests, which for the good of the country should have been but one, did not come to an end until 1916, when a Parliamentary Committee, presided over by Mr. Justice Bailhache, investigated charges brought, not by private firms, but by other persons against the factory in particular and the Royal Flying Corps in general. They were found to be without foundation.

Like the private firms the factory suffered from the start from lack of skilful designers, for the simple reason that such skill had yet to be acquired; yet the number of them grew from 6 in 1909 to 275 in 1916. The earliest machine to achieve success was the Blériot Experimental—the B.E. type—closely followed by the Farman Experimental (F.E.) in which the observer, seated in the nose of the machine, ‘could fire a gun forward without being obstructed by the air-screw’. This was a great advantage until the invention of synchronizing gears which enabled a machine-gun to be fired between the revolving blades of the propeller without striking them. The third type of machine produced at Farnborough was the Scouting Experimental (S.E.), the fourth the Reconnaissance (R.E.), this last being an almost completely stable machine.

Even in this summary account of the Farnborough factory a place must be found for E. T. Busk, of King’s College, Cambridge, who joined it in the summer of 1912. In addition to his scientific qualifications he was a daring and skilful pilot and flew the Reconnaissance Experimental machine—the R.E.1—in all kinds of weather and proved its inherent stability. To the great loss of aviation in general and of this country in particular, Busk was killed in an accident on the 5th November 1914.

The Navy placed more reliance on the products of private firms and made particular use of the Short Brothers, Oswald, Eustace, and Horace. At that time much of the development of naval flying was due to the indefatigable efforts of Captain Sueter, who urged the formation of a Naval Air Service composed of both airships and aeroplanes. While the Air Battalion was working hard to conquer and maintain the mastery of the air on Laffan’s Plain, the first pupils of Cockburn were seeking to perform a similar feat on behalf of the Navy at Eastchurch. In 1911 Lieutenant Samson made the first successful flight from the deck of a warship in December of that year by taking off from H.M.S. *Africa* and landing in the sea, where his aircraft was successfully supported by air-bags. In March of the following year, Horace Short produced the first seaplane, which was successfully flown by Lieutenant Samson; in the meantime Sopwith had constructed the first flying-boat.

Once the Government had taken official interest in flying it

moved with greater speed. In the late autumn of 1911 the Committee of Imperial Defence instructed its standing sub-committee to consider the future development of aerial navigation for naval and military purposes and the measures which might be taken to secure for this country an efficient aerial service. The sub-committee worked hard and quickly and before the year was out had recommended the creation of a British Aeronautical Service to be known as the Flying Corps. It was to possess two Wings, a Naval and a Military, and a common Central Flying School. The sub-committee also urged the appointment of a permanent Air Committee to deal with all air questions affecting both the Admiralty and the War Office. The details were worked out by a technical sub-committee of which the chairman was the Right Hon. J. E. B. Seely. Among its members were Samson and O'Gorman. The recommendations of this sub-committee were approved by the Committee of Imperial Defence, the Royal Flying Corps was constituted by a Royal Warrant on the 13th April 1912, and a month later the Air Battalion and the naval Air Organization were absorbed by it.

Among the reasons which led the Government of the day to take this all-important step was undoubtedly the evidence given to the sub-committee by Captain Sueter of the Royal Navy and Captain Dickson of the Army. Sueter's contention was that there was sufficient intelligence—intellect he called it—in both the Services to produce, together with the advisory committee and the manufacturers, an organization with which Great Britain could attempt the command of the air. This he thought to be as vital for this country as its long held command of the sea. 'I think it will come to that,' he said. 'I do not say that we wish to do so, but I think we shall be forced to do so.' Seldom have words been more prophetic. His Army colleague, Captain Dickson, went more fully into the problem. He maintained that fighting in the air would be inevitable, for in the next war both sides would soon have large numbers of aircraft each trying to discover the movements of the other's land forces. The result would mean inevitable conflict. The consequences of introducing a new element into warfare were thus of the utmost importance to a people like ourselves who live on an island. We had been compelled to become masters of the seas in order to be masters of ourselves. Now that the air had been conquered, the task was doubled.

In addition to the memoranda of these two officers the sub-committee had also before it a very full and illuminating report from Lieutenant Ralph Glyn, an officer of the Air Battalion. He had been present at the air exercises carried out by the French Air Corps in August 1911 at Châlons, and reported that France had

364 PILOTS NEEDED

at her disposal some 220 aeroplanes, and that her Air Corps was being very elaborately and completely trained, especially in the art of co-operating with other arms. In this the French Army was superior to the German, which had concentrated mostly on dirigibles. This report was confirmed by another submitted by Captains F. H. Sykes and Fulton who were present at military air trials held at Rheims in October and November of that year.

All this weight of evidence was more than sufficient to move the standing sub-committee and it is to the credit of Asquith's Government that, faced with its report, there was no hesitation. Nor was the shock administered by Germany a few months previously to the world in general and to Britain and France in particular be forgotten. On the 1st July 1911 the German naval gunboat *Panther* sailed into the harbour of Agadir and the spectre of a European war loomed suddenly large and black upon the political horizon. With great reluctance the Government began shortly after to prepare for war. Somewhat more than two years were to elapse before it was to break out, little time in which to put the country and the Empire into a state and posture of defence. The creation of the Royal Flying Corps did not take place a day too soon.

Three months before it came into being, the heads of Government departments learned, at a meeting held in January 1912, that only eight officers of the Royal Navy and eleven of the Army were actually able to fly. Haste therefore dominated the scene. The first problem was to obtain enough flying men. The Central Flying School, to be common both to the naval and military wings of the Royal Flying Corps, was accordingly established that April at Upavon Downs on Salisbury Plain and began work under canvas. The War Office decided that the military wing should consist of seven aeroplane squadrons, each to number twelve machines, led by a squadron commander flying a thirteenth. There were to be two pilots for each machine and the reserve was to be equal to the active strength. This meant that 364 trained pilots were necessary. The problem of their status became immediately apparent. Should they hold commissioned or non-commissioned rank or should some hold one and some the other? The War Office was at first in favour of a half-and-half system, but to organize it would have required more time than was available and it was presently abandoned. The *pros* and *cons* of the decision in favour of commissioned rank for pilots cannot be debated here. It was reached only after considerable discussion, during which some one predicted that 'not many men of the skilled mechanic class would be ready or willing to risk their lives as pilots'. The experience of the last war, and still more of this, has proved the fallacy of such a forecast. On the other hand, the

THE ROYAL NAVAL AIR SERVICE

experiment tried in the early days of the Royal Flying Corps, of training a small number of non-commissioned officers as pilots to fly officer-observers, was reported upon unfavourably. It was said that they lacked that quality of soul which may be inadequately defined as inspired recklessness and which is one of the essential qualities of a good pilot in time of war. The reason is not far to seek. In the earlier years of this century, and indeed long before, promotion from private soldier or lower deck rating was a long, slow business. Men who had enlisted in the Navy or Army did not generally reach non-commissioned rank until they were well beyond the maximum age of a successful wartime pilot. Moreover, in those days class distinctions were stronger than they are to-day. Whatever reasons moved the authorities in 1912 or 1913, the facts are that on the outbreak of war in 1914 the great majority of pilots in both wings of the Royal Flying Corps were commissioned officers.

Another problem, not solved until 1918, soon raised its head. Should the new force be a separate branch of the armed forces of the Crown and be given a status equal to that of the Royal Navy and the Army? There is little doubt that this was the original intention. The first recommendation of the standing sub-committee of the Committee of Imperial Defence was that 'the British Aeronautical Service should be regarded as one and may be designated the Royal Flying Corps'. This view was never fully accepted by the Royal Navy. It was too revolutionary, or perhaps it ran counter to too strong a tradition. It should not be forgotten that the Navy first received the title of Royal in the reign of King Henry VIII. Be that as it may, the Navy was not slow in marking its independence. The Naval Flying School had already been established at Eastchurch and the headquarters of the Naval Wing of the Royal Flying Corps were set up in the same place. All officers and men in the Naval Flying School were placed under the orders of the captain of H.M.S. *Actaeon* and borne on the books of that ship. Very soon the official name, Royal Flying Corps, Naval Wing, fell into disuse and the expression the Royal Naval Air Service took its place. The result was that the Royal Flying Corps soon came to mean only the Military Wing. The original intention had been for the Naval Flying School to take pilots trained in the joint Central Flying School and give them specialized training in naval air work, but almost from the start the Naval Flying School began to train officers from the very beginning of their flying career and continued so to do throughout the war of 1914-18. It is apt to be forgotten that the use of aeroplanes, in so far as the Royal Navy was concerned, was, in those days, a matter of much speculation and experiment. Neither the strategic nor the tactical possibilities of these new machines

AN APPEAL FOR MECHANICS

could be accurately defined without them. For this, time was denied the Navy, which was forced, only a little more than two years after flying had been officially recognized as necessary to the conduct of war, to play a major role in an all-absorbing struggle for the safety and preservation of our island and our Empire. The uses of the Military Wing of the Royal Flying Corps, on the other hand, were more easy to discover and define. It would be mobilized to operate with an expeditionary force and the main duty of its officers and men would be to keep the Army commanders in the field as fully informed as possible of the movements and positions of the enemy. Thus its first and most important task was to be that of reconnaissance.

Not only did the new Service need flying men, it also required mechanics qualified in their several crafts; for aeroplanes, if they were to fly, had to be kept airworthy. This task required the skill of a large variety of trades, and as early as 1912 an appeal to join the Royal Flying Corps was made to blacksmiths, carpenters and joiners, clerks, coppersmiths, draughtsmen, electricians, fitters, harness-makers, instrument repairers, metal turners, painters, pattern-makers, photographers, riggers, sail-makers, tinsmiths, turners, wheelwrights, whitesmiths, wireless operators, wood turners, cable joiners, chauffeurs, drillers, dynamo attendants, electric bell fitters, joiners' helpers, machinists, motor fitters, plumbers' mates, switchboard attendants, tool grinders, and wire men. It was from men in this long list of trades that the mechanics of the Royal Flying Corps were chosen. They were the Service ancestors of the ground crews of to-day.

Captain F. H. Sykes was the first to command the Military Wing, with Lieutenant B. H. Barrington-Kennett as his adjutant. Two months before he took over, Captain R. Brooke-Popham had joined the Air Battalion and, when the Royal Flying Corps was formed, he and a number of other officers, including Captain E. B. Loraine, Grenadier Guards, were serving at Farnborough where they sought to learn the art of flying on one Blériot Experimental, one Bréguet, and two Bristol box kites. On the formation of the new corps, Brooke-Popham was put in charge of No. 3 Squadron consisting of that part of the aeroplane company of the Air Battalion which had remained at Larkhill. Captain C. J. Burke, Royal Irish Regiment, was given command of No. 2 Squadron formed out of the officers and men at Farnborough. Other squadrons followed in the next twenty months. Thus, in September 1912 No. 4 was created out of part of No. 2, in August of the following year a flight of No. 3 became No. 5, and Nos. 6 and 7 were in being by May 1914. The speed of development depended on the time taken by the Central Flying School to train the pilots.

Captain Godfrey Paine, R.N., became the school's first commandant. Thenceforward a small, but steady, stream of recruits began to flow towards the corps. The first course began on the 17th August 1912. In addition to the main business of learning to fly, the pupils were taught map-reading and signalling, learned the intricacies of the internal combustion engine and the theory of reconnaissance. Thirty-two out of thirty-four pupils had passed by the end of December. Their instruction had been delayed by a decision that they were to be taught only on biplanes. Of these there were only four available, and all of them were soon damaged. The decision to use only biplanes for training was taken after several fatal accidents, the first being that which befell Captain Loraine who, with his passenger, Staff-Sergeant R. H. V. Wilson, was killed near Stonehenge on the 5th July 1912 when flying a Nieuport monoplane. These two men were the first flying casualties of the Royal Flying Corps. That evening the School was ordered to continue flying as usual. 'An order like this not only creates a tradition, it pays the right honour to the dead who died on duty no less than if they had been brought down by the guns of the enemy.'

The work of the squadrons was, at the outset, largely of an experimental kind. It could hardly have been otherwise when a vast new field of warfare, in an element hitherto the monopoly of birds, kites, and balloons, had to be explored. The explorers were the officers and men of the Royal Flying Corps. One practice became the rule from the start; any discovery or success achieved by a squadron or an individual was immediately placed at the disposal of the rest. The English genius for developing the team spirit, not at the expense of the individual but for his profit, has nowhere a better example than in the early life of the Corps. It soon became necessary to co-ordinate the work of experiment in order to concentrate it, and accordingly, in March 1913, an Experimental Branch of the Military Wing of the R.F.C. was established and put under the command of Major Herbert Musgrave. He had been one of those few fortunate individuals who saw Blériot land on the cliffs of Dover on the 25th July 1909, and he at once reported the significance of this performance to the War Office. Its reaction can be inferred from the fact that it was not until the spring of 1913 that Major Musgrave's repeated applications to be allowed to serve in the air were granted. Almost immediately he was put in charge of experiments which covered a wide range and included ballooning, kiting, wireless telegraphy, photography, meteorology, bomb-dropping, and co-operation with artillery. He concentrated on wireless telegraphy, and made good progress with the aid of Lieutenants D. S. Lewis and B. T. James, both of the Royal Engineers, who

'MILITARY AIRMEN ALSO FLEW'

profited from the inventions of Captain H. P. T. Lefroy, also of that corps, and in charge of all wireless experimental work for the Army since 1909. By June 1914 the two lieutenants, flying ten miles apart from Netheravon to Bournemouth, were able to communicate with each other. Major Musgrave eventually commanded the Headquarters Wireless Unit of the R.F.C., which, in December 1914, became No. 9 Squadron. Having worked out the problem of supplying the R.F.C. with wireless machines, Major Musgrave returned to the General Staff in March 1915 and was eventually killed on the 2nd June 1918, having persuaded a battalion commander to allow him to accompany a patrol in 'No Man's Land'. 'Such men, though the records of their lives are buried in a mass of tedious detail, are the engineers of victory.'

The most important of the experiments carried out by the infant R.F.C. was, as might be expected, the method of securing and assuring its co-operation with other arms. This was worked out during the army manœuvres of 1912 and 1913. Brooke-Popham's squadron, No. 3, concentrated on artillery observation. Since wireless telegraphy had not reached the practical stage, its main difficulty was to devise means to communicate with the guns. Various experiments with flags, written messages, and coloured Very lights were carried out, none of them very successful. In those days, the problem which overshadowed all others was how to induce the rest of the Army to have some faith in flying machines. The performance of four aeroplanes, which flew in a gale of wind during a field day held towards the end of May 1912, made a certain impression. This was increased by the military aeroplane trials held at the beginning of August, though the winner of the two first prizes was the indefatigable Mr. Cody, whose biplane was, nevertheless, found unsuitable for Army purposes. Two hundred Members of Parliament went down to Salisbury Plain to watch one of the competitions, but the weather was judged too bad and the competitors confined themselves to a few circuits round the aerodrome in the afternoon. The R.F.C. was more enterprising. Despite the high wind, Brooke-Popham with an observer on an Avro, and Captain Hamilton on a Deperdussin, started out to fly some forty miles from Larkhill to Wareham. The first took three hours to cover this distance; the second was unable to do so. Both returned in the evening, after battling half the day with the tempestuous wind, to find the competitors at the trials taking off for a few quiet circuits now that it had fallen. These flights were reported in full in the Press, which at the end of many columns of description added as an afterthought, 'Military airmen also flew'.

It was not until the autumn manœuvres of that year that the

CO-OPERATION WITH OTHER ARMS

impression made by the aeroplane on the Army could be described as striking. Four divisions—the attacking under Sir Douglas Haig and the defending under General Grierson—began operations at dawn on the 16th September. To each side had been allotted seven aeroplanes. Brooke-Popham found himself with the defenders. General Grierson's cavalry commander had informed him at a conference held the day before that, since the opposing forces were so far apart, he would be unable to produce any definite information about the enemy for at least twenty-four hours. Brooke-Popham thought he could do better. His aeroplanes took off at 6 a.m., and a little over three hours later he had given General Grierson a complete, accurate, and detailed picture of the dispositions of Sir Douglas Haig. So valuable did the work of No. 3 Squadron prove that the left flank of the defenders, which could only be reached by two roads, was left unguarded since it was found sufficient to keep them under constant observation from the air. In an endeavour to avoid being seen, the attacking troops moved under the cover of hedges and sought, unsuccessfully, to conceal their wagons and guns with branches of trees. The airship 'Gamma' also assisted in the work of reconnaissance, and the result of these manœuvres was such that the R.F.C., from being at the bottom of the form, went at once to the top and were even asked to verify information collected by the cavalry. This was not the first occasion on which aeroplanes had been used in mimic warfare. Jullerot, with Sefton Brancker as his observer, had taken part in the Indian Army manœuvres of January 1911. In a forty minute flight they discovered the retreating 'enemy' who had had a start of more than seven hours, and a complete picture of their whereabouts and dispositions was drawn by Brancker on paper attached to a piece of cardboard hanging down the back of Jullerot from a string round his neck.

No. 3 Squadron spent the winter at Larkhill under conditions which made training far from easy; the officers lived at the Bustard Inn, two and a half miles west of the field, the men at Bulford, three miles to the east. It hoped to repeat the success of 1912 at the manœuvres of 1913. They took place against a skeleton force and the aeroplanes did not, therefore, have enough to observe, so that their full value was not easily apparent. No. 3 Squadron, however, learnt much. It had been brought up to a war strength of twelve machines, and in the four days of the manœuvres lost five of them through forced landings and other accidents. Nevertheless, on these and on divisional manœuvres they succeeded in covering a total of 4,545 miles. Both Brooke-Popham and Barrington-Kennett took full account of the lessons learnt and embodied them in two reports in which can be seen the shadow of things to come—only too soon. In the operational field, for

THE AEROPLANE AS SCOUT

example, it was discovered that accurate observation could be made from a height of at least 6,000 feet; in the field of organization, that aeroplanes were useless without proper transport and an efficient ground staff; in the educational field, that the R.F.C. must be taken seriously by commanders and their staffs. One discovery bid fair to interfere with the chain of command. It was found that an aeroplane could ascertain the movements of hostile forces when they were within a few miles of the troops on whose behalf it was scouting. Under the rules, this information had to be passed to the Commander-in-Chief, to whom it was frequently of no great value. It was, however, of urgent importance to the commander of the advance guard, but only too often a message telling him of the enemy's presence arrived from headquarters some time after the enemy had already made that presence felt. Was the pilot to drop his news to the advance guard before reporting it to the C.-in-C.? A year later, the retreat from Mons and the Battle of the Marne supplied the answer.

During this time the work of No. 2 Squadron, under Burke, was of a similar nature to that of No. 3. Burke himself was a fanatic. He had what would nowadays be termed 'a one-track mind', but this singleness of purpose stood the R.F.C. in general, and his squadron in particular, in good stead. From time to time he jotted down maxims whose practical wisdom is as fresh to-day as it was in 1912 when he first began to put them on paper. 'When things are going well, the man in charge can give play to his fears', is a saying seldom heeded by arm-chair critics; while the wise station or group commander does not forget that 'a squadron commander should want a good squadron and not to be able to break records', or, 'waiting about on an aerodrome has spoilt more pilots than everything else put together'. It was Burke who flew the first B.E., a two-seater tractor biplane. This machine became famous first in the Air Battalion and later in the R.F.C. When it was at last wrecked in January 1915 it had seen almost three years of service and 'had become the revered grandfather of the whole brood of factory aeroplanes'.

Some months after its formation, No. 2 Squadron was transferred from Farnborough to Montrose on the east coast of Scotland, and began its move thither early in January 1913. Five of its officers did the journey by air in nine days, two of them in B.E.s and three in Maurice Farmans. They took off on the 17th February, and that evening Lieutenant C. A. H. Longcroft, having been compelled to land at Littlemore, near Oxford, spent the night in the local lunatic asylum. On the 20th they had all reached Towcester, by the 22nd, York. The next stop was Newcastle. Only two of them reached it in the day and these had had to land many times to ask the way. The directions they received were

more suitable for land than air travellers, since 'turnings in the road and well-known public houses are not easy to recognize from the air'. By the 26th February they had all arrived at Montrose, and here a period of strenuous training began. By September they had advanced sufficiently to take part in the Irish Command manoeuvres, flying 400 miles each way to do so with no engine failures. The local inhabitants were much impressed and the citizens of Limerick crowded the churches to pray for their safety. Machines, thanks to the greater skill of the pilots and the unremitting work of the ground staffs, were becoming more reliable. Between May 1913 and June 1914 the squadron had eighteen aeroplanes in constant use and lost only three of them, and this despite their habit of flying in all weathers, often when the wind was faster than the aeroplane. Tortoise races were sometimes organized, the winner being 'the machine that was blown back fastest over a given course'. On November 22nd Longcroft with Sykes as passenger, in a B.E. fitted with an extra petrol tank, remained in the air for seven hours twenty minutes, flying from Montrose to Portsmouth and back to Farnborough.

Day after day the work of training went on under Burke, their indefatigable commander. He had an eye for everything. Men must be trained for the work they would have to do on active service and 'every other employment' he notes 'must be regarded as temporary and a side issue'. Barracks had to be kept clean with the minimum number of men; young officers had occasionally to be reproved and bidden to take their work more seriously and make themselves 'older in character'. Map reading, signalling, propeller swinging, car starting, military and technical training, the prompt payment of small accounts, these and a hundred other matters fill his diaries. It is small wonder that, when war came, one of his first orders to pilots of No. 6 Squadron (which he then commanded) was that, if any of them encountered a Zeppelin and failed to shoot it down, they were expected 'to take other measures'; it is no wonder at all that the pilots, with such a leader, were prepared to do so.

Meanwhile, the Naval Wing of the R.F.C. was not idle. As has already been said, its problems were far more difficult and far less easily defined than those of the Military Wing. The main difference between them was that between attack and defence. It was decided that the aeroplanes and airships at the disposal of this Wing could supplement or even take the place of the coastguard service. They could therefore best be used from shore bases along our coasts, and a decision to set up a chain of these within flying distance of each other was taken by the Admiralty in October 1912. The first was established at Eastchurch, the

CHURCHILL TAKES TO THE AIR

second at the Isle of Grain, and by June 1913 similar stations had come into being at Calshot, Felixstowe, Yarmouth, and Cromarty. All of them were hampered by lack of machines, but the zeal of the naval pilots was supported from the outset by Winston Churchill, then First Lord of the Admiralty, and Murray Sueter, Director of the Air Department. Churchill, who had first taken the air in a seaplane early in 1912, made frequent flights, and in so doing aroused the apprehensions of more than one member of Parliament. The Government was urged not to allow its members 'to expose their valuable lives unnecessarily' or alternatively to give the Opposition an opportunity of drawing up a list of those cabinet Ministers 'who could better be spared'.

By the time the war of 1914-18 broke out the Naval Wing possessed 52 seaplanes, of which 26 were serviceable, and 46 more were on order. In the naval manœuvres of July 1913, two seaplanes were successfully flown from the launching platform of the *Hermes*, which had now become the headquarters of the Naval Wing. To take off from the surface of the water was more difficult and was, in fact, impossible if any kind of sea was running. In a Minute dated the 26th October 1913, Churchill recommended three types of machine for the Navy—'an oversea fighting seaplane to operate from a ship as base, a scouting seaplane to work with the fleet at sea, and a home service fighting aeroplane to repel enemy aircraft . . . and to carry out patrol duties along the coast'. The Minute goes into considerable detail when discussing the most suitable method of attacking Zeppelins, which at that time were considered to be the chief menace from Germany as far as the air was concerned. An aeroplane, thought the First Lord, should attack these huge machines obliquely from above by dropping small bombs or fire-balls so that a string of them 'would be drawn like a whiplash across the gas bag'. A method very similar to this was used by Flight Sub-Lieutenant R. A. J. Warneford when he destroyed a Zeppelin on the night of the 7th June 1915 over Belgium.

Experiments which began as early as June 1912 were carried out for the purpose of detecting submarines from the air, and it was found that in clear weather a periscope could be seen from a considerable distance. Thirty years later, the full fruit of those experiments was being plucked by the very long-distance aircraft of Coastal Command, far out over the tumbled waters of the Atlantic.

Commander Samson and Lieutenant E. H. Clark-Hall found themselves, in March 1913, in charge of experiments connected with bomb dropping. In December of that year, floating charges, weighing from 2 to 40 lb., were exploded in the sea beneath

EXPERIMENTS IN BOMBING

Maurice Farman seaplanes flying at various heights to test the effect upon them of the explosion. The general conclusion reached was that an aeroplane could drop a 100 lb. bomb containing 40 lb. of explosive from a height of 350 feet without danger to itself. Experiments were made also with the towing of explosive grapnels and the discharge of small grenades, the object in each case being to discover a weapon which would destroy the Zeppelin. At the outbreak of the war of 1914-18, 200 grenades with specially sensitive fuses were available for this purpose.

So the work went on and by the 31st December 1913 the Naval Wing, whose headquarters had been transferred to Sheerness, possessed about 100 trained pilots and had flown no less than 131,081 miles in the previous twelve months. There is no doubt that at this time it was further advanced than the military in the art of dropping bombs, and was allowed by the Admiralty in January 1914 to place the result of its work at the disposal of its Army comrades. Despite this attempt at *rapprochement*, one of the few made, the tendency was for the two Wings to drift apart, so much so that on the 1st July 1914 the Naval Wing of the Royal Flying Corps became the Royal Naval Air Service, a *de facto* and *de jure* separate entity. There had not been wanting officers in both the great Services anxious, or at any rate prepared, to co-operate with each other. Even in Whitehall an effort was made in the same direction by an Air Committee presided over by Colonel Seely, with Vice-Admiral Sir John Jellicoe as vice-chairman. It was soon, however, to vanish into the element from which it derived its name. For tradition was always too strong, and when Great Britain was called upon to face Germany in the first of the two great conflicts which have engaged her attention in the present century, she did so with two separate air services. Seventeen days before that day dawned, Churchill mobilized the Fleet, and from the 18th to the 22nd July 1914 the newly formed Royal Naval Air Service took part in the review and manœuvres at Spithead. On the 20th all available naval aircraft, numbering seventeen seaplanes and two flights of aeroplanes, headed by Commander Samson, flew in formation over the assembled ships. Some naval officers were much impressed by this performance, others considered that it was no more than 'an acrobatic exhibition useless for the purpose of war'. The aircraft, they said, flew low because they could not fly high.

A month before the naval review, the Military Wing, soon to be the Royal Flying Corps whole and entire, had been concentrated at Netheravon, where all the squadrons met together and exchanged ideas, particularly in regard to reconnaissance and co-operation with other arms. Their meeting-place was officially styled a

PILOTS IN READINESS

'Concentration Camp', at that time a term of no sinister significance. It was the machines which received the castor oil, not those who flew them. Thus, by a fortunate turn of fate or a prescient stroke of policy, both the Military and Naval Air Force was concentrated only a few short weeks before they were to go into action for the first time. The officers and men belonged to two Services, each with a long and honourable history behind it, but they were about to wage war in an element, largely unknown, as members of a corps not then possessing the advantage that tradition confers upon a ship's company or a regiment; yet the very fact that they were new and untried made for a strong feeling of comradeship. They were to create, not to inherit, a tradition which a later generation was to enhance with matchless gallantry.

4. 1914: The Squadrons Go to France

AUGUST 4th 1914 found the Royal Flying Corps in the midst of heavy labours. Five only, of the eight squadrons of which it was originally to have been composed, were ready. The remainder were still on paper and there was no reserve. Officers and men had been hard at it as soon as the serious nature of the international situation was realized. 'I was constantly going in and about Whitehall,' says Sir Frederick Sykes, 'on various errands as we put the finishing touches to our precautions. We were all working day and night with very little sleep . . . there was no time for various discussions and details were dropped; we all acted on our own initiative and to the best of our ability.' They did, indeed. Four years later, Captain P. B. Joubert de la Ferté was still under pursuit from a firm of aeroplane contractors from which he had ordered and removed a spare pair of wings 'without sufficient authority'. Nevertheless, when the sound of Big Ben striking eleven p.m. drifted faintly to the ears of a vast, silent crowd in front of Buckingham Palace and told them that the nation was at war, the R.F.C. was not ill-prepared.

It took the field under the command of Brigadier-General Sir David Henderson, who had learnt to fly at the age of forty-nine and, as Director of Military Training at the War Office, had done everything he could to encourage the new arm. His Chief of Staff was Acting Lieutenant-Colonel F. H. Sykes who, after a period of active service in the South African war, had begun ballooning as far back as 1904. When seconded six years later for work at the War Office, he spent the early mornings learning to fly and eventually took his ticket on a Bristol biplane at Brooklands in June 1911. The remaining members of the staff were Captain W. G. H. Salmond, Major H. R. M. Brooke-Popham, who acted as Deputy-Assistant Quartermaster-General, and Lieutenant B. H. Barrington-Kennett, Staff Captain. Plans for the transport of the Royal Flying Corps across the Channel to France had been worked out in detail. Each squadron was allowed three days to mobilize; it was then to proceed on the fourth day to Dover and on the sixth day to fly to its first destination. The transport of all squadrons and the Aircraft Park were to travel by sea. So meticulous and excellent was the staff work that nothing had been forgotten, from the hour and place of departure of the various trains carrying the transport to the articles to be carried by each pilot. These included a revolver, field-glasses, a spare pair of goggles, a water-bottle, a small stove, biscuits, cold meat, a piece of chocolate, and soup cubes.

RENDEZVOUS AT AMIENS

The total force thus mobilized and ready for action consisted, besides the Headquarters party, of Nos. 2, 3, 4, and 5 Squadrons and the Aircraft Park, made up of 24 aeroplanes in cases and 4 motor-cycles. Attached to it was the ground staff of 12 officers and 162 other ranks.

According to plan, the squadrons set out for Dover on August 8th from their various home bases and all arrived to time except No. 4 Squadron, which was delayed at Eastchurch by the first air-raid alarm of that, or any other, war. The journey was accomplished at the cost of two casualties, the first incurred by the Royal Flying Corps after the declaration of war, Lieutenant R. R. Skene of No. 3 Squadron and his observer, Air Mechanic R. K. Barlow, being killed in a crash soon after taking off. The night was spent at Dover, the pilots lying beside their machines in the hangars, their slumbers being interrupted by the prodigious snores of one of the flight commanders and by the loud-voiced exhortations of the N.C.O. of the guard who urged the sentries to make it clear that they were armed with rifles. 'There isn't a man in England,' he maintained, 'what won't stop when you pulls the bolt back.'

The next day, the 13th August, they all set off for France. The first machine, piloted by Lieutenant H. D. Harvey-Kelly, of No. 2 Squadron, took off at 6.25 a.m., the remainder following at two-minute intervals. The machines themselves were a somewhat heterogeneous collection. No. 2 and No. 4 Squadrons had nothing but B.E.2s. No. 3 Squadron had a mixed bag of Blériots and Henri Farmans, and No. 5 Henri Farmans, Avros, and B.E.8s. The lesson that squadrons should be equipped each with only one type of machine had not yet been learnt, for, in those days, such vital questions as the necessity or otherwise of high speed, the advantages or disadvantages of mounting guns, and many other matters equally important had not been settled. Nevertheless, every machine, which took off on that hot August morning, arrived in France, and all but one at Amiens, their destination. Lieutenant Harvey-Kelly had some trouble with his squadron commander, Major Burke, for taking a short cut, thus landing ahead of his commanding officer, and Lieutenant R. M. Vaughan, who was forced down with engine trouble at Boulogne, was arrested by the French authorities and kept in confinement for a week. The machines which by noon were assembled on the broad Amiens airfield were the forerunners of the mighty swarm destined ultimately to overwhelm the German Air Force. They had reached their destination and were ready for war entirely owing to the hard work of the whole corps during the previous two years. In 1912 the War Office had estimated that it would take at least four years to organize the Royal Flying Corps. Most of that task had been accomplished in two: 105 officers, 775 other

ranks, 64 aeroplanes (including those travelling in cases with the Aircraft Park), and 95 mechanical transport vehicles were, on the 13th August 1914, an integral part of the British Expeditionary Force. Behind them at home were 41 officers and 116 machines, of which, however, only about 20 were fit for flight.

If the machines of the squadron were somewhat heterogeneous, the transport was even more so. It was made up of a collection of Army and private motor-cars and commercial vans. 'The ammunition and bomb lorry of No. 5 Squadron had belonged to the proprietors of a famous sauce: it was a brilliant scarlet with the legend, painted in gold letters on its side, *The World's Appetizer*.' Its colour proved of great use in the retreat from Mons, for pilots were able to identify it easily from the air. There were also two Maples furniture vans and a lorry originally designed for holding refuse.

The advent of the Royal Flying Corps was received with the greatest enthusiasm by the French. The men were billeted on the outskirts of Amiens and loaded with fruit and vegetables by their hosts. The officers found accommodation in the Hotel du Rhin. In obedience to their orders they had arrived carrying only the kit prescribed. Pyjamas were not included in it and were hard to come by. The French did their best; nightgowns of every shape, size, and colour were forthcoming, and Joubert de la Ferté was privileged to behold 'a six-foot-two flight commander in a very attenuated nightgown, dancing the can-can in the passage with one of his subalterns who was wrapped in sufficient white material to make the main-sail of a full-rigged ship'.

On Sunday the 16th August, Nos. 2, 3, and 4 Squadrons and Headquarters left Amiens for Maubeuge. Accidents caused four further casualties, two B.E.8s, familiarly known as 'Bloaters', crashing, one on that day and one on the 18th. 'As we approached Maubeuge,' says Sykes, 'matters assumed a grim aspect. The British troops whom we encountered marching towards Mons looked magnificent, but one could not help feeling the immense anxiety with which the atmosphere was charged. Was that fatal delay in ordering mobilization going to make us too late? Desolation and fear were depicted on the faces of the inhabitants. The towns were depressingly grey. . . .' The Royal Flying Corps were soon to be in action and to play a vital part in the opening stages of the war.

In accordance with unhappy precedent, the British field army began by executing a long and difficult retreat. Such an operation of war, one of the hardest to carry out with success, has more than once been imposed upon it. It was so in 1808; it was so again in 1914 and for a third time in 1940. A nation which relies upon a navy for her safety, which has always been bitterly opposed to

THE FIRST AIR RECONNAISSANCE

conscription and has accepted it only under pressure of overwhelming events, inevitably runs the risk at the outset of a war of putting its field army in grave peril. However well-trained, however efficient that army may be—and there is no record in history of soldiers more skilful, more resolute, or more courageous than those commanded by Sir John Moore and Sir John French—it is always lacking in numbers and is only too often opposed to vastly superior forces of the enemy. The opening of the campaign in 1914 was no exception. In pursuance of a plan originally conceived by von Schlieffen and subsequently altered by the younger von Moltke, the German High Command was determined to throw all its troops against the French in a huge encircling movement designed, by a march through Belgium, to turn their left flank and finish the war at one tremendous stroke by the capture of Paris. To oppose this grandiose manœuvre was the French Army of seventy-two divisions, reserves included, and Sir John French's expeditionary force of but four infantry and one cavalry division. By the 13th August these had all been successfully conveyed across the Channel and concentrated in the Mons-Le Cateau area without interference from the enemy. The heroic Belgian resistance at Liège and Namur may well have upset the German time-table, but there is evidence that it was not the original intention of the enemy to attack the British Expeditionary Force during its passage to France or during the period of its concentration. He may well have calculated that he would achieve a more striking victory by waiting a short while and then cutting off this 'admirable little force' placed, as it was, in a position where it seemed possible, even easy, to annihilate it. The Royal Flying Corps played an important, indeed a vital, part in the frustration of this design.

It began modestly enough. On Wednesday the 19th August Captain Joubert de la Ferté of No. 3 Squadron flying a Blériot, and Lieutenant G. W. Mapplebeck of No. 4 Squadron in a B.E., took off at 9.30 a.m. to carry out the first aerial reconnaissance of the war. They were to fly together as far as Nivelles and then to separate, Joubert to reconnoitre the area round Genappe, and Mapplebeck, Gembloux where enemy cavalry were reported in large numbers. The weather was cloudy and the machines soon lost each other. Mapplebeck presently found Gembloux, noted that only a small body of cavalry was visible and returned, after a halt at Le Cateau, to Maubeuge where he handed in his report at noon. Joubert wandered for two hours in cloud, eventually reaching Tournai where he landed. Being unable to find or to obtain news of the Belgian army he had been sent out to locate, he flew on to Courtrai where he was told that the headquarters of the Belgian Flying Corps was at Louvain. With this

information, together with his own observations of occasional railway trains and small pickets of troops, he returned to Maubeuge.

During the next three days further reconnaissance showed that there were no enemy troops immediately to the front of Sir John French's army and it was not until the 22nd—the day on which the first casualty caused by direct enemy action occurred, Sergeant-Major Jillings, the observer of Lieutenant M. W. Noel, being wounded in the leg by a rifle bullet over the village of Maffle—that twelve reconnaissance flights discovered a large body of the enemy moving towards the British front. The machines of the Royal Flying Corps were beginning to pierce the fog of war. The information brought in by Captain L. E. O. Charlton and Lieutenant V. H. N. Wadham of No. 3 Squadron was of great significance. Failing to see any troops near Brussels, they landed at Moerbeke to make inquiries of the inhabitants and were informed by the mayor that a large body of Germans, cavalry and cyclists among them, were passing through Grammont, two miles away. Hastily taking off they flew over them and confirmed this information and a later reconnaissance discovered a long column, estimated at the strength of an army corps, moving westward along the Brussels-Ninove road. This turned out to be von Kluck's second corps about to execute that favourite tactical device of the German army, the envelopment of the enemy. Had this movement of von Kluck's not been observed, the German hopes of cutting off and annihilating what the Kaiser a few days before had described as 'the contemptible British army', might well have been achieved. Henderson and Sykes at once realized the vital importance of this information and took it in person to G.H.Q.

That day, too, von Kluck received his first intimation of the presence of Sir John French's army, strangely enough, not from one of his own, but from a British aeroplane. Lieutenants V. Waterfall and C. G. G. Bayly of No. 5 Squadron, flying an Avro, were shot down and the remains of their machine gave the Germans the first definite information that the British Army was in the field against them. This Avro was the first machine to be destroyed by fire from the ground, though, in those early days, every endeavour was made by the troops of both sides to shoot down any aeroplane they saw. 'We were rather sorry,' says Joubert, 'they [the British troops] had come, because up till that moment we had only been fired on by the French . . . now we were fired on by the French *and* the English. . . . To this day I can remember the roar of musketry that greeted two of our machines as they . . . crossed the main Maubeuge-Mons road along which the British column was proceeding.' To make the

FLYING ON THE RETREAT

identification of aircraft easier, a Union Jack was painted on the under surface of the wings and a few months later the 'roundel' made up of concentric circles of red, white, and blue, still the distinguishing mark of aircraft of the Royal Air Force, was substituted. Not only was it more easily visible from the ground, it was also not so liable to be confused with the German marking, a black Maltese Cross.

On the evening of 22nd August Sir John French held a conference at Le Cateau, where a decision was taken, at the request of General Lanrezac commanding the 5th French Army on his right, to fight a defensive action and to hold on for at least twenty-four hours. The reports from the air had given him more than a hint that von Bülow's army was across the Sambre and that an enveloping movement was to be expected from Grammont. On the next day, the 23rd, the battle of Mons was fought on a front of twenty-five miles by infantry supported by artillery, slow in coming into action and provided with no high explosive shells. Throughout the day the Royal Flying Corps was busy flying up and down the battlefield looking for enemy movements and locating enemy batteries. That night the great retreat began, but for the Royal Flying Corps it had begun on the morning of the 23rd when its Headquarters were shifted from Maubeuge to Le Cateau. For the next nine days Headquarters were never in the same place for more than twenty-four hours except at Compiègne where they stayed for forty-eight. This constant move, slightly, but only slightly, ahead of the retreating troops, put a heavy strain on the staff and the transport. A new aerodrome had either to be made or chosen almost daily by officers ill-provided with maps—not anticipating a campaign in northern France, the War Office had supplied detailed maps of Belgium only—who were required to follow routes often so complicated that a lorry-load of guides had to be taken with the transport column and one of them dropped at every junction or cross-road. Nevertheless, the work of reconnaissance did not cease, though the pilots often took off without knowing whether the aerodrome would still be in British hands when they returned to it. 'The extraordinary part about the retreat,' to quote Joubert once again, 'was the contrasts that one experienced from day to day; one night sleeping under a hedge in a thunderstorm; the next in a comfortable private house; the third in the most modern type of hotel with every luxury and convenience.' It was on Friday the 28th August that the first attack delivered from the air on the Royal Flying Corps was made; a German machine flew over the aerodrome at Compiègne about noon and dropped three bombs which blew the doctor head over heels but did no damage. It was vigorously engaged from the ground, among those who opened

VON KLUCK TURNS SOUTHWARDS

fire being an air mechanic who climbed on to the top of a petrol can in a laudable attempt to increase the range of his revolver.

Throughout those grim days, when the eyes of the world were fixed on a small corner of France and the expression '*Reculer pour mieux sauter*', gave heart to the courageous while increasing the fears of the faint-hearted, the Royal Flying Corps remained in constant action. Its reports became of ever-increasing value as its machines kept the outflanking movements of the right wing of the German army under constant observation. The crisis was soon to come. On August 31st, Headquarters were at Juilly. A scare that Uhlans were but a few miles away put the officers and men composing them in a hasty posture of defence. They took up positions in a sunken road and a French liaison officer, Prince Murat of the dragoons, 'showed his sense of the importance of the occasion by donning his shiny tin helmet with its long horse-hair tail'. The occasion, however, was even more important than the prince was aware of at the time. On that day reports from the pilots and observers showed that the heads of von Kluck's columns had ceased to move westward and were now marching south and south-east.

'The movement of the German right wing [von Kluck's army] on the 30th and 31st August had a decisive effect on the campaign.' What had happened was this. Up to the 30th August, von Kluck, in accordance with the general plan of the German High Command, was moving towards the lower Seine. His vanguards had on that day reached a line running roughly from a little north-east of Amiens, through Mezières, Hangest, Fresnoy to Roye, while his cavalry had advanced from Noyon to Ribecourt. The next day in response to a message received from von Bülow commanding the Second German Army on his immediate left, which urged him to play a part in gaining full advantage from the victory won by the Germans the day before, von Kluck wheeled his forces and by the end of that day they were moving, some due south, others south-east, and had reached a position running approximately from Ailly, almost due south of Amiens, through Montagny, Sains, Tricot, Mareuil, Chevrincourt to Ribecourt and over the Oise to Tracy le Mont and Vic on the River Aisne. The beginnings of this swerve, which proved fatal to the hopes of the Germans, were immediately seen by the Royal Flying Corps. Before midday, Lieutenant A. E. Borton and Captain E. W. Furse of No. 5 Squadron had reported the movements of the Germans at Noyon and Ribecourt, and earlier that morning Captains D. de G. Pitcher and A. H. L. Soames of No. 4 Squadron had seen a column of the enemy stretching from Roye to Chevrincourt. Lieutenants C. G. Hooking and K. P. Atkinson of the same squadron shortly after confirmed this report; and then,

R.F.C. ON THE MARNE

flying westward towards Amiens, discovered large numbers of the enemy moving on Montdidier. Through the eyes of these six officers, General Sir John French perceived the truth, although for the moment he could not take full advantage of it.

Continuing to retreat for four more days, the British army reached and crossed the Marne, so did the Germans who on 3rd, 4th, and 5th September passed it and its tributaries Le Petit and Le Grand Morin, and then took up a line running west to east from Villiers through Mortcerf, Vaudoy, Villiers St. Georges to Chatillon. All these movements of von Kluck had been seen and reported with great accuracy; he had marched into a pocket between the 5th French Army on his left flank and the newly formed 6th French Army on his right. At the bottom of the pocket stood the British Expeditionary Force. By midnight on September 4th General Joffre realized that the decisive moment had come. Orders for attack were issued and these reached British Headquarters soon after 3 a.m. They were for a general assault to begin at dawn on the 6th. The battle of the Marne which developed on that and the three succeeding days saved Paris and ensured the eventual victory, four years later, of the Allies.

As it had been during the retreat from Mons so during the battle of the Marne the Royal Flying Corps was busy all day long over the heads of the enemy. Immediately before the battle began, certain elements of No. 5 and No. 3 Squadrons were detached for reconnaissance duties with the First and Second Corps commanded respectively by Sir Douglas Haig and Sir Horace Smith-Dorrien. With each R.F.C. detachment went a wireless aeroplane to keep Headquarters constantly in touch with the situation. All the machines were in constant use throughout the battle, working directly with the Corps Commanders and supplying much useful tactical information. They also dropped messages to the advancing troops warning them of the enemy's whereabouts. Meanwhile the Headquarters of the Royal Flying Corps, after remaining for three days at Melun, moved forward and finally established themselves on the 12th September at Fère-en-Tardenois. The great retreat followed by the decisive advance had come to an end.

The lessons learnt during those strenuous, tragic, happy days have never been forgotten. They left an indelible mark on the Royal Flying Corps, which in less than three weeks had won its spurs. At first British General Headquarters had shown themselves a little hesitant in their acceptance of the information contained in air reconnaissance reports. Very soon, however, as their accuracy became proved beyond question, increasing attention was paid to them and full credit was immediately given to the Royal Flying Corps for the vital part they had played in

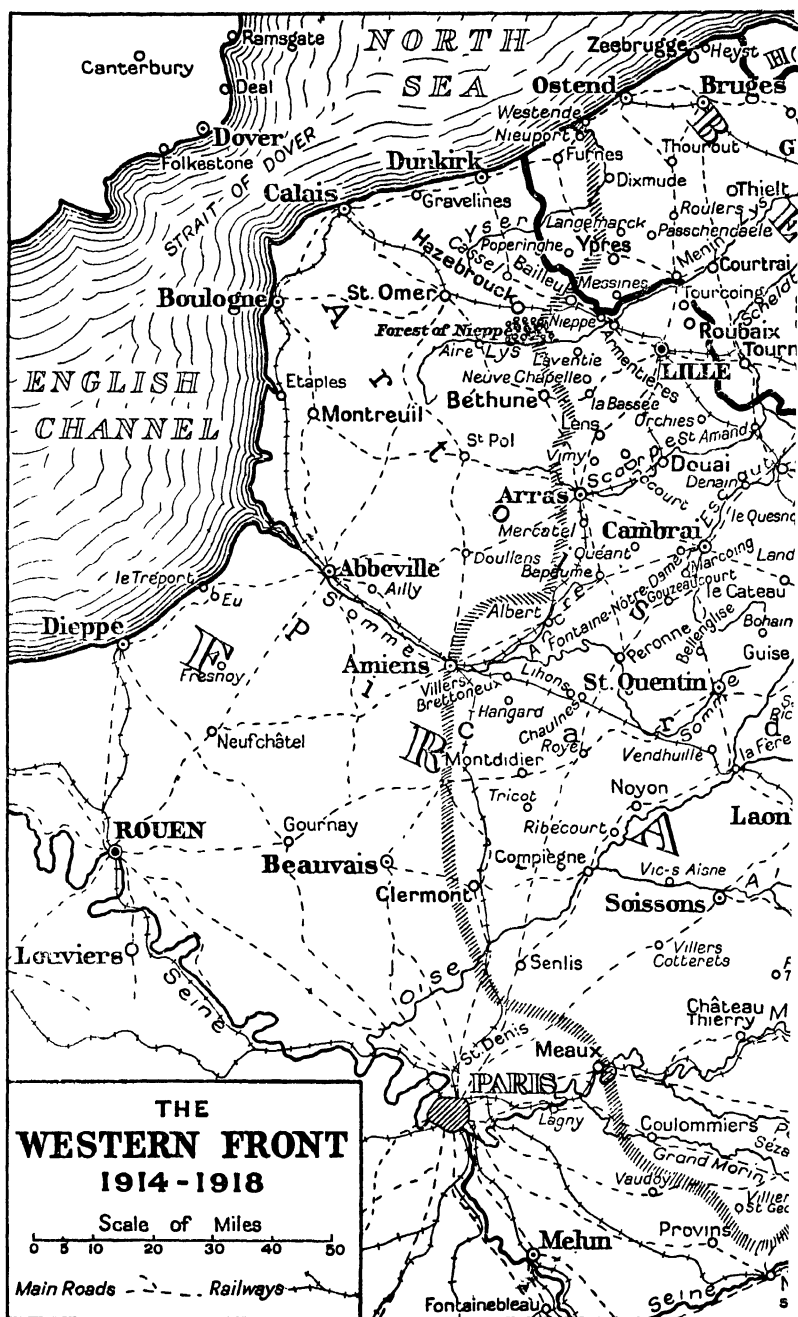
THE FIRST AIR COMBATS

making possible the victory of the Marne. 'I wish particularly to bring to your lordship's notice,' wrote Sir John French in his dispatch of September 7th, 'the admirable work done by the Royal Flying Corps under Sir David Henderson. Their skill, energy, and perseverance have been beyond all praise. They have furnished me with the most complete and accurate information which has been of incalculable value in the conduct of operations.' General Joffre was equally emphatic.

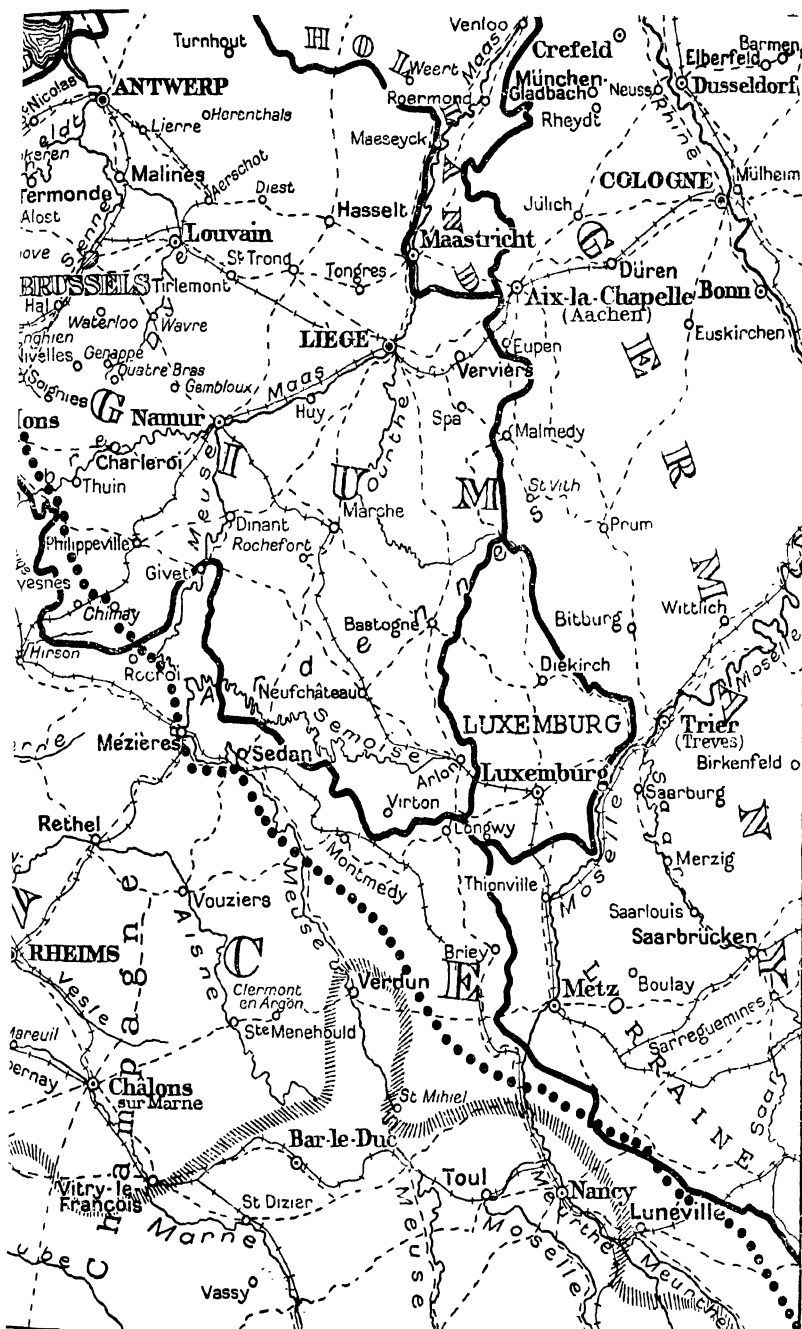
In this dispatch, Sir John French made the first official reference to fighting in the air. By that date, the 7th September, the Royal Flying Corps had destroyed five German aircraft. The first enemy machine, an Albatros biplane, had appeared over Maubeuge on the 22nd August; six of the R.F.C. took off to chase it, but it had too long a start and got away. Half an hour after its departure a Henri Farman of No. 5 Squadron was still 'climbing steadily over the aerodrome at about 1,000 feet in a strenuous endeavour to catch the Boche'. It was No. 5 Squadron which had been in the forefront in experimenting with the mounting of machine-guns in their aircraft; they and the other squadrons were soon to learn the enormous advantage gained in any air conflict by superiority in height. It was not till the 25th August that an enemy machine was brought down; three aircraft of No. 2 Squadron, one of them flown by the zealous Harvey-Kelly, flew round and over it and eventually forced it to land. Harvey-Kelly and his observer landed nearby and chased the German crew who, however, escaped into a wood. The British airmen then returned and burnt the machine. Another German aircraft was on that day captured near Le Quesnoy. At this time no aeroplane, except the Farmans, which were too slow, was armed, though the pilot or observer carried a revolver, a carbine, or more rarely a shot-gun.

Bomb-dropping was in an equally primitive state of development. On the 1st September an unnamed pilot of a Royal Flying Corps machine dropped two bombs on two columns of German cavalry near Villers-Cotterets causing a stampede among the horses. In default of any bomb-dropping gear, hand grenades were carried in the pockets and larger bombs 'slung or tied about the person'. Experiments were also tried with a French invention consisting of a tin container holding a number of *flèches*, small steel arrows of the length and thickness of a pencil. No very striking success was obtained by the use of this weapon.

During the battle of the Aisne most of the Royal Flying Corps machines were based on Saponey, some two miles from Headquarters, and used for long-distance reconnaissance. The weather, which had been excellent during the retreat and for most of the battle of the Marne, broke on the 9th, and for the next few days a succession of violent storms accompanied by heavy rain greatly



Limit of German advance, Sept 1914



Line at Armistice, November 11, 1918 ●●●●●●●●●●

SPOTTING FOR THE ARTILLERY

hampered air operations. Four machines of No. 5 Squadron were completely wrecked; one Henri Farman was only saved by pushing it against a haystack, laying a ladder over the front skids and then piling large paving stones on the ladder. On the 12th September there were not more than ten machines serviceable.

It was on the morning of that day that Lieutenants L. Dawes and W. R. Freeman of No. 2 Squadron force-landed within two hundred yards of some large German columns between Soissons and Laon. They hid in a nearby wood which, as soon as the abandoned machine was noticed, was searched by German cavalry. They failed, however, to find the two officers who, when night fell, began to walk in the direction of the Aisne, some eight miles away. They reached it at three in the morning after passing several German pickets who, singing and drinking, were making too much noise to hear them. Dawes and Freeman slept for three hours, were then woken up by heavy gunfire and realized that they were in front of the German positions. They swam the Aisne, dried their clothes at a house, and eventually returned to their squadron, after an absence of more than two days. Their troubles were not yet over; Major Burke, their commanding officer, reprimanded them severely for violating an order that no two pilots should fly together in the same machine.

It was at the battle of the Aisne that the wireless machines of No. 4 Squadron were first used to observe artillery fire. They were piloted by Lieutenants D. S. Lewis and B. T. James, both of whom were subsequently killed. The pioneer work of these two officers was invaluable and was soon recognized as such, notably by General Sir Horace Smith-Dorrien. It was their practice to fly over enemy batteries and direct the fire of our own artillery upon them. Here is a record of the activities of one of them between 4.2 p.m. and 4.37 p.m. on the afternoon of the 24th September 1914:

- 4.02 p.m. A very little short. Fire Fire.
- 4.04 p.m. Fire again. Fire again.
- 4.12 p.m. A little short; line O.K.
- 4.15 p.m. Short. Over, over and a little left.
- 4.20 p.m. You were just between two batteries.
Search two hundred yards each side of your last shot. Range O.K.
- 4.22 p.m. You have them.
- 4.26 p.m. Hit. Hit. Hit.
- 4.32 p.m. About 50 yards short and to the right.
- 4.37 p.m. Your last shot in the middle of three batteries in action; search all round within 300 yards of your last shot and you have them.
- 4.42 p.m. I am coming home now.

BAD WEATHER ON THE AISNE

Another method of signalling used very often because of shortage of aircraft equipped by wireless was the firing of Very lights over enemy batteries. Attempts were also made to signal their position by lamp, but these were not very successful.

The R.F.C. machines were now being daily subjected to fairly constant fire from anti-aircraft guns, of which the enemy were bringing an ever-increasing number into use. These guns were soon christened 'Archies', a name given to them, it was said, by a British pilot who, when being fired at by them, was wont to call out, 'Archibald, certainly not', the refrain of a popular music-hall song of the day.

The battle of the Aisne soon developed into what was called at the time 'the race for the sea', but it was, in fact, an attempt by each of the opposing forces to outflank the other. It presently gave place to the first battle of Ypres which was in full swing in the second half of October, reached its crisis on the 31st, and was over by 21st November. At the price of enormous losses the British had held on grimly and defeated the flower of the German armies more than four times their strength. Throughout the struggle bad weather forced the R.F.C. to play a secondary part. By the 12th October its Headquarters had been moved from Fère-en-Tardenois to St. Omer, where reinforcements in the shape of No. 6 Squadron reached them on the 16th October, after a few days' service in Belgium. Despite the handicap of bad weather, information, obtained by flying tactical reconnaissances to a depth of fifteen to twenty miles behind the enemy's lines, proved of considerable value, especially that concerning the position of German batteries and the movement of rolling-stock at the various stations behind the German front. There were, occasionally, combats with German aircraft, notably one which took place on the 22nd November when an Avro with a 80 horse-power Gnôme engine mounting a Lewis gun just above the observer's seat fought a German Albatros with a 100 horse-power Mercedes engine. The Avro flew underneath the Albatros, a little in front of it and less than a hundred feet below. This manœuvre enabled the British observer, Lieutenant F. G. Small, to empty two drums into the German machine. Though neither the German pilot nor the observer, a commissioned officer, was hit they broke off the fight and landed behind our lines. The British officers landed beside them to take them prisoners. Hardly had the Albatros come to rest when the German observer was seen to drag the pilot, an N.C.O., from his seat, throw him on the ground, and begin to kick him heavily in the body.

In the meantime the Royal Naval Air Service had been far from idle. As has already been related, it had become separate from the Military Wing a month before the outbreak of war, when,

COASTAL PATROLS BEGIN

under the command of Captain Murray Sueter, R.N., Director of the Air Department, and Captain G. M. Paine, R.N., Commandant of the Central Flying School, it numbered 6 Wing Commanders, 19 Squadron Commanders and 12 Flight Commanders. There were, in addition, 91 Flight Sub-Lieutenants and Warrant Officers while the Petty Officers and men numbered some 700. This force had at its disposal 39 aeroplanes and 52 seaplanes, of which about half were immediately available. There were also seven airships, including the Parseval, the Astra-Torres, and the Beta. Sixteen of the seaplanes had been fitted with wireless telegraphy apparatus with which to keep in touch with the various seaplane stations established round our coasts.

The main task of the R.N.A.S. was to defend the east coast from air attack and to safeguard shipping in the Channel. No provision had been made to supply the Fleet with eyes from the air; not one of the airships was powerful enough to do so, but by October 1914 the *Hermes* had been refitted to carry three seaplanes. Before the month was out she was torpedoed in the Channel, however. About this time the Admiralty converted three cross-Channel steamers—the *Empress*, the *Engadine*, and the *Riviera*—to serve as seaplane carriers.

With some help from the R.F.C., the R.N.A.S. began the war by instituting a coastal patrol of the east coast from Kinnaird's Head in Aberdeenshire to Dungeness in Sussex. As soon, however, as the Germans had established themselves in Belgium, the menace of attack from that country was judged to be such that the R.N.A.S. were concentrated between the Humber and the Thames on a patrol line running from Immingham to Clacton. A sharp watch was kept for Zeppelins which might attempt to attack London, but none appeared. An airship patrol in the Channel, carried out by the Astra-Torres and Parseval, opened on the 10th August, the average duration of a patrol being twelve hours. As soon as the British Expeditionary Force had been safely landed in France these routine patrols gave place to scouting flights over the North Sea and the Channel. The work both of patrol and scouting was tedious and by no means safe. A number of pilots were lost and a number of seaplanes wrecked. Commander J. W. Seddon, for example, was 'ditched' at 9.35 a.m. on the 17th December and, with his observer, Leading Mechanic R. L. Hartley, drifted until three in the afternoon, when a small steamer, the *Orme*, approached. Both men were by that time very exhausted, Hartley having had frequently to crawl out on to the wing to counteract the possibility of capsizing. The *Orme* saved both crew and machine.

All this was defensive work, but the R.N.A.S. was burning to attack the enemy. Proposals for a raid on Wilhelmshafen and

AIR BASE AT DUNKIRK

Kiel were put forward as early as the 13th August but no machine was then capable of making such an attack. The necessary experimental work was immediately put in hand, and the technical staff worked at such pressure that by 1915 they had succeeded in producing a 225 h.p. Wight Tractor capable of flying for 7 hours at 70 knots, and another aircraft—the 225 h.p. Short Tractor—which could carry a bomb load of 5 cwt. a distance of 300 miles.

Before any serious attack could be made on German bases it was necessary to establish at least one of our own on the continent of Europe. The place at first chosen was Ostend, and the squadron, the Eastchurch, then the most highly trained of all naval air units. It was commanded by Samson, who had under him men of such wholehearted determination that he 'never had to deal with a single disciplinary offence'. On the 27th August the squadron moved to Belgium with a variety of aircraft and a small airship for patrol duties. The equipment, including motor-cars and lorries and the ground staff, was shipped by sea. The whole squadron arrived safely, the only incident of note being the adventure of its commander who came under rifle fire when landing and was subsequently stalked by two Royal Marines under the mistaken impression that he was a German airman.

Only three days were spent at Ostend, during which Samson made a reconnaissance by motor-car which took him as far as Bruges where 'the Civil Guard hastily donned their uniform . . . and turned out briskly with weapons and valour. They used, we found out later, to be quick-change artists from uniform to plain clothes and vice versa according to the circumstances.' On the 30th August the squadron was ordered back to England for it was then judged impossible to defend Ostend with the small force, one brigade of marines, available. They flew via Dunkirk where they landed, and one of the pilots, Lord Edward Grosvenor, smashed his Blériot beyond repair. This mishap delayed the whole squadron for three days, and during that time urgent representations to Whitehall were made by the French General commanding at Dunkirk and the British Vice-Consul who pleaded that the squadron should be allowed to stay where it was and co-operate with the French. Their prayers were answered, for the Admiralty issued the necessary order instructing Samson 'to operate against Zeppelins and enemy aeroplanes and to carry out reconnaissances as required by the French general'. The Admiralty, indeed, went further. It decided that all territory within a hundred miles of Dunkirk should, if possible, be denied to German Zeppelins and aircraft. To do this it was considered that temporary bases forty to fifty miles inland should be established. It was proposed to reinforce Samson with '50 to 60 armoured motor-cars and 2 to 300 men'. 'The immunity of

EXPLOITS OF COMMANDER SAMSON

Portsmouth, Chatham, and London', the Admiralty maintained, 'from the dangers of an aerial attack is clearly involved.' By the 31st October a seaplane base had been established at Dunkirk in a part of the harbour occupied by the works of a shipbuilding company. It remained an active centre throughout the war and its aircraft were soon busy locating enemy guns, bombing railway communications, and keeping a look-out for German submarines.

At the outset Samson found himself grievously short of aeroplanes. He therefore opened his campaign with motor-cars on which Maxim guns had been mounted. On the fourth day after his arrival at Dunkirk he started out with two of them to attack six German officers in a staff car reported to be on their way via Bailleul to Cassel. Engaging them at a range of 500 yards he wounded two and caused their car to beat a hasty retreat. He was aided in this task by a sixty-five-year-old French captain of gendarmes who had arrived with a long-barrelled pistol, ten men, and a wife in a limousine. Insignificant though this engagement was the Germans 'got the idea into their heads that there was a large force of English round about Cassel'.

Two days later the gallant wing commander reached Lille in a vain attempt to destroy German transport. He himself was nearly destroyed by a ginger-beer bottle flung by an excited individual through the windscreen of his car which 'gave me a severe blow on the jaw'. The enthusiasm of the Prefect and citizens of Lille was echoed throughout the countryside and British prestige rose to great heights. In a day or two, two of the cars were fitted with armour made of boiler-plate and an application for reinforcements sent urgently to Whitehall. On the 8th September the First Lord of the Admiralty, Winston Churchill, sent 250 Marines under Major Armstrong. A routine ~~for~~ reconnaissance was soon worked out. The cars operated in close touch with the aircraft who flew ahead to watch and report the movements of German troops and motor-cars along the road. On the 19th September a temporary base was established at Morbecque just north of the forest of Nieppe. The force there established was to operate with the French troops in that neighbourhood under the orders of the French general. On the 22nd September the cars reconnoitred Aniche, between Douai and Valenciennes and had a brisk engagement in its streets with German cavalry. Several more engagements took place on the next and succeeding days. By the 1st October the Germans forced their way into Douai, which had been occupied by the French a week earlier. Samson was in the town with his cars and made for a bridge over the canal held by the Germans. A sharp fight recaptured it, and he then held a vital cross-roads for a quarter of an hour until shelled out of it. This small engagement, in which the casualties were but eight

THE FIRST RAID ON GERMANY

wounded, enabled the French garrison at Douai to extricate itself. Such guerrilla warfare as these motor-car operations must find a place in this narrative because they were carried out by men of the Royal Naval Air Service, sailors and therefore by tradition adventurers. Their courage put great heart into the desperate, reeling French at a most critical moment.

In the meantime all aircraft available continued to operate from Dunkirk. On the 22nd September the first raid on Germany itself was carried out from an advance base set up at Antwerp, soon to fall into the hands of the Germans. The attack was made by four aeroplanes, two flying to the airship sheds at Dusseldorf and two to those at Cologne. Only one of them, piloted by Flight Lieutenant Collet, reached the target. He glided down over Dusseldorf from 6,000 to 400 feet, but one of his bombs fell short and the others unhappily failed to explode. All four machines returned. The next attack was made on the 6th October when the evacuation of Antwerp was already under way. The town and airfield were under heavy bombardment, the citizens beginning to flee in panic, but the squadron remained on its aerodrome and two Sopwith Tabloids, single-seater fighters carrying 20-lb. bombs, piloted by Flight Lieutenant Marix and Squadron Commander Spenser Grey made ready, the first to attack Dusseldorf, the second, Cologne. Though the weather was bad, the military situation was worse, and the start could not be postponed beyond the early afternoon. Spenser Grey ran into a thick mist over his objective, failed to find the airship sheds, and dropped his bombs on Cologne's main railway station, reaching Antwerp once more at a quarter to five. Marix—twenty-seven years later almost to the day as an Air Vice-Marshal he was to bomb and sink a German vessel in the Norwegian harbour of Aalsund—had better fortune. The weather was clear at Dusseldorf; he dived at the Zeppelin shed and released his bombs from 600 feet, scoring direct hits. The roof caved in and flames shot to a height of 500 feet. Marix had hit Zeppelin Z IX, only just completed and also the machine and erecting shop. His aircraft was hit in several places but he coaxed it back to within twenty miles of Antwerp and completed his return to base on a bicycle borrowed from a peasant.

At 6 o'clock the general order to evacuate the town was issued, but the aerodrome which was between Antwerp and the enemy was not given up until the machines working on it were ~~under~~ under rifle fire from the surrounding woods. The two gallant pilots succeeded in reaching Ostend by noon on the following day.

The fall of Antwerp ended all plans for a British offensive in Belgium. The British forces had to retreat, and this they did by stages, the Royal Naval Air Service with them. 'During the last

BOMBING THE ZEPPELIN SHEDS

three weeks,' Samson reported, 'we had been always on the go without a home, without any idea where we were going to next, without food, sometimes without adequate transport, and yet we had kept going. . . .'

Before the end of 1914 two more raids had been carried out on German bases. The first took place on the 21st November. On that day a Swiss engineer was about to partake of an early lunch in his hotel situated near the Zeppelin sheds at Friedrichshafen on Lake Constance. On his way to the dining-room he heard the sound of approaching aircraft and then of gunfire. To these were shortly added nine heavy explosions, all from the area of the works and sheds. Earth and debris were flung into the air and had hardly fallen to the ground before a vast explosion in one shed and another in the gas works sent sheets of flame hundreds of feet into the air. The raid which achieved this result was a model of planning and execution. Its planner was Lieutenant Pemberton Billing, its leader Squadron Commander E. F. Briggs, the aircraft, four Avros with 80 horse-power Gnôme engines. The total force employed was no more than four pilots and eleven mechanics.

The take-off was to be from the nearest point in France, the frontier town of Belfort, where the machines and their pilots were to be housed in the airship shed belonging to the aerodrome. For fear of German spies, known to be active in the area, all movement was made at night. The French were eager to attack Friedrichshafen, and the Governor of Belfort had collected much valuable information concerning the target and the prevailing weather conditions to and from it. This knowledge was added to by Pemberton Billing, who crossed Lake Constance in disguise and made investigations on his own. Since it seemed most probable that the Zeppelins stationed there were to be used primarily against England, the R.N.A.S. was accorded the privilege of making the raid provided it could be carried out within thirty days. It took them but sixteen from the moment they left Southampton on 10th November till they returned there on the 26th, their deed accomplished.

The actual attack was carried out on 21st November. Of the four machines which started, one piloted by Sub-Lieutenant Cannon failed to rise and broke a tail skid. The other three—flown by Squadron Commander Briggs, Flight Commander Babington, and Flight Lieutenant Sippe—got off without mishap and flew a crooked course to avoid violating Swiss neutrality. This took them first to Mulhausen and then over the Black Forest to a point north of Schaffhausen. Here they turned southwards to reach Lake Constance. The total distance was about 125 miles, a very long way for those days. '11.30 a.m. Arrived extreme end of lake

and came down to within ten feet of water', says Flight Lieutenant Sippe's log. 'Continued at this height over lake, passing Constance at a very low altitude, as considered less likelihood of being seen. Crossed lake and hugged north shore until five miles from objective. Started climb and reached 1,200 feet. Observed twelve or fourteen shrapnels bursting slightly north of Friedrichshafen.' This was the anti-aircraft fire being directed against Squadron Commander Briggs's machine, which was subsequently brought down by machine-gun fire after he had dropped his bombs. On landing, he had to endure the rough usage of the German populace and the praise of the German army. It is small wonder that he was taken to hospital in a fainting condition.

'When half a mile from sheds', Sippe's log continues, 'put machine into dive, and came down to 700 feet. Observed men lined up to right of shed, number estimated 300-500. Dropped one bomb in enclosure to put gunners off aim, and, when in correct position, two into works and shed. The fourth bomb failed to release.' After making several unsuccessful attempts to get it away he turned, went down to just above the surface of the lake and made off, landing safely at Belfort at 1.50 p.m. His two companions delivered similar, and even more successful, attacks, for all their bombs fell on the target and, together with his own, caused the damage seen by the Swiss engineer.

As in the raid on Dusseldorf and Cologne the bombs weighed but twenty pounds and each aircraft carried four. Seeking to be wise after the event the Germans doubled the strength of the garrison at Friedrichshafen, slung huge nets above the roofs of the sheds, greatly increased the number of machine- and anti-aircraft guns, installed five searchlights, and stationed two additional gunboats offshore. All these men and all this material remained there until the end of the war, for the sheds were never attacked again, and were thus kept in idleness for four years by the daring of three R.N.A.S. pilots during four hours of a winter's afternoon.

The fourth and last raid of the year was designed to present the Zeppelin sheds at Cuxhaven with a Christmas present of bombs. Unlike the other three, it was carried out by seaplanes from three carriers—the *Engadine*, the *Riviera*, and the *Empress*—escorted by H.M.S. *Arethusa*, H.M.S. *Undaunted*, and a screen of destroyers and submarines under the command of Commodores R. J. B. Keyes and R. Y. Tyrwhitt. The object of the raid was not merely to bomb the sheds but also to obtain all possible information on the number and class of ships at Wilhelmshafen, in the Schillig Roads, or in the mouth of the Elbe. By 6 a.m. on Christmas morning the force had reached a position about twelve miles north of Heligoland. Soon after 7 a.m. seven out of nine

CARRIER OPERATION

seaplanes took off. The squadron remained cruising about for eight hours in perfect, though bitterly cold, weather, just outside the main naval bases of the enemy. It was attacked twice, half-heartedly by two Zeppelins, and more resolutely by a number of seaplanes, but suffered neither casualties nor damage. By 10 a.m. three of the British seaplanes returned and were picked up. Of the remaining four, the crews of three were rescued by submarine E.11 close to Norderney Gat; the proceedings were watched by a Zeppelin which manœuvred to drop bombs on the submarine. They fell a few seconds after the last airman had been hauled aboard and the submarine had crash-dived to forty feet. The fourth crew was picked up by a Dutch trawler and kept for some time in Holland. The raid was partially successful. Though the sheds at Cuxhaven were not found, a fairly comprehensive survey of the German harbours and roadsteads was carried out, notably by Flight Commander C. F. Kilner and his observer, Lieutenant Erskine Childers, the author of *The Riddle of the Sands*, who, seven years later, was to meet a tragic death at the hands of an Irish Free State firing-squad. The presence of seven battleships, three battle-cruisers, and a large number of other warships was reported.

Thus by the end of 1914 both the R.N.A.S. and the R.F.C. had seen much hard fighting and were beginning to find their way about in the air. Soon a severer test, a fiercer ordeal, was to confront them—the R.F.C. at Neuve Chapelle and Festubert, the R.N.A.S., many hundreds of miles to the eastward, at the Dardanelles.

5. Air Reconnaissance

A New Element in War

OTHER things being equal it is the commander with the most complete and accurate knowledge of his enemy who wins the battle. This knowledge, to which the general term 'Intelligence' has been applied for many years, is made up of a vast amount of information accumulated by all kinds of persons in all kinds of ways. It extends from reports obtained, through both open and secret channels, on the whole range of the enemy's activities to the descriptions of scouts of what they have seen with their own eyes of his dispositions in the field. Apart from a very occasional ascent beneath a man-carrying kite or a balloon, no scout, to use that word in its widest sense, had, prior to the war of 1914-18, ever attempted consistently to observe the enemy from the air. To do so was at the beginning the main duty of the Royal Flying Corps. For that it had been created, for that it had been hastily trained in those twenty-four months of concentrated effort, which was all that Fate allowed before it had to face the task of putting into practice theories, preached often enough, but most imperfectly tested.

As has already been recorded the reconnaissance flights carried out during the retreat from Mons and the battles of the Marne and the Aisne were, to quote once more the words of Sir John French, 'of incalculable value in the conduct of operations'. The reports had, however, been brought in by pilots making use entirely of their own eyes and their own trained minds with which they assessed the value of what they saw. No one was more aware than they, however, of the deficiencies of the human eye and the human memory. However great the control exercised by a disciplined will, they could, they knew, never record a complete and entirely accurate impression of what was going on a few hundred or a few thousand feet beneath the landing-wheels of the B.E. or the Maurice Farman in which they flew. Indeed the speed at which even those very early types of aircraft moved through the air made it impossible to note every single detail. Movements of troops were, of course, always visible despite the attempts made by both sides to use the cover of wayside trees and hedges; so also were batteries of guns, and, farther back, rail and road transport. But the small isolated infantry position, manned by a few men and a machine-gun, might often remain undetected from the air and be discovered only when attacked from the ground.

That this would be so had been recognized from the start. From the beginning of 1914, No. 3 Squadron under the energetic

THE R.F.C. AT NEUVE CHAPELLE

the air photographs, nor could it be accurately assessed from the ground. It was on these strong points, four in number, that the enemy established his resistance.

During the assault itself the R.F.C. was continuously employed. The First Wing, under Colonel Trenchard, operating with the First Army, had been divided up into a number of detachments working, some with Army Headquarters, some with the guns and some with the attacking troops. The group artillery soon found that the effectiveness of their counter-battery work was very greatly enhanced by the presence of aircraft which, to quote the War Diary of No. 1 Artillery Group, 'were invaluable in sending information as to the positions of hostile batteries which were active'. The Royal Naval Air Service also took a hand, though not in the air. No. 2 Armoured Car Squadron and the armoured train 'Churchill', both of which had taken part in the defence at Antwerp, came into action that day. The armoured train destroyed the tower of the village church of Aubers on which an enemy observation post had been established, and four armoured cars waited with cavalry to exploit the break-through which was never achieved.

Throughout the day not only did the R.F.C. make numerous reconnaissances, it also played an offensive role, being entrusted with the task of delaying, by bombing, reserves on their way to the battle-field from the Lille-Menin-Courtrai district. This time—another innovation—the bombing was carried out by the Second and Third Wings according to a pre-arranged plan. The key objectives of the Second Wing were Courtrai railway station and the Menin junction, while those of the Third Wing were the railway stations at Lille, Douai, and Don. The bombing plan was put into execution in the afternoon, having been preceded in the morning by a successful attack on some buildings thought to house the Headquarters of the German defence. Captain G. I. Carmichael, carrying one 100-lb. bomb underneath his Martinsyde Scout, dived from 3,500 to 120 feet to release it on the railway fork north of Menin. It struck and destroyed the rails and sent his Scout rocketing skywards out of control for the moment. This was the first time a bomb of such weight had been dropped from so low an altitude. Captain L. A. Strange, of No. 6 Squadron, was, in the meantime, bombing the station at Courtrai. Coming low over it he was fired on by a sentry whom he silenced by a hand-grenade flung from the aircraft. Flying still lower, he then put the three bombs he was carrying into a stationary train, banked hard in an effort, only just successful, to avoid telegraph poles and wires, and returned safely. It was learnt subsequently that his bombs had killed and wounded seventy-five German soldiers in the train and had held up all traffic for three days.

THE FIRST GAS ATTACK

During the next morning, which was misty, three aircraft of No. 4 Squadron set out to bomb the railway junction at the south-east corner of Lille. One, with a crew of Lieutenants A. St. J. M. Warrand and G. W. Mapplebeck, was shot down. Warrand was mortally injured but Mapplebeck, eluding the Germans, escaped to Lille where he was hidden for some days by the inhabitants and had time to read the notices offering a reward for his capture. He escaped via Holland and returned to his squadron in the middle of April, only to be killed a year later in a crash.

On the third day of the fighting the Germans put in many counter-attacks, their direction and weight being observed and reported from the air. A number of bombing attacks were again made on railways, and it was on this day that the first bombing accident occurred. The bombs used were French shells, hastily converted, and having almost no safety devices. One of them, while being loaded on to Captain R. Cholmondeley's machine, fell on its nose and exploded. The aircraft was destroyed, the pilot and eleven men killed and four seriously wounded. The officer commanding, Major J. M. Salmond, discovered that the remaining bombs had not gone off. He forbade any one to go near the wreckage. During the night he removed them himself.

Both sides learnt lessons from the battle of Neuve Chapelle. The Allied High Command was convinced that it should be regarded as a pattern on which future attacks should be modelled; the only difference would be the scale. This would grow and grow till the break-through, and with it final victory, was achieved. The Germans, on the other hand, were not impressed. By the judicious use of artillery, of which they had a great preponderance, they believed that they could hold any attack which the British and French could mount in the west while a decisive blow was being delivered in the east against Russia. Moreover, the German High Command was prepared to take risks and, being the unscrupulous leaders of an unscrupulous nation, to make use of any and every weapon which might secure a decisive advantage. While General Joffre and Sir John French were concerting their plans for a new attack and testing the strength of the enemy by an assault on Hill 60 dominating the Ypres area, the enemy was getting ready to strike a devastating, a dastardly blow.

The ebb and flow of the fight for Hill 60 was still in progress when a German, taken prisoner by the French, drew the attention of his captors to a box attached to a face mask which he carried and which, he said, was a respirator issued to all troops about to take part in an attack on Ypres salient. In it, he averred, a lethal gas was to be used for the first time. Intelligence of what was soon to be in the wind reached British Headquarters on the 15th April. The next day No. 6 Squadron was sent on a special

THE ROAD TO YPRES LAY OPEN

reconnaissance. Nothing unusual was observed either on that day or on the five succeeding, and no attack developed, the reason being that throughout that period the wind was blowing from the British trenches into those of the Germans. At 5 o'clock in the evening of April 22nd, however, Captain L. A. Strange, of No. 6 Squadron, on patrol above the German lines, saw a cloud, yellow-green in colour, sprout from the German trenches and roll towards a part of the line held by the French 45th Division. He watched it for some little time and then returned to make his report. From the air it looked innocuous enough but on the ground, in its clinging embraces, men fought for breath and died, blue-faced and choking. The road to Ypres lay open.

Not realizing the full extent of the success which this type of warfare had secured for them, the Germans were slow to exploit their gain. Yet the position of the Allies was very desperate. It was saved by the ardour of the troops, especially the Canadian Division, who held their ground and, lacking masks, breathed through handkerchiefs soaked in their own urine. These gallant men and others, equally gallant, engaged the assaulting Germans in a series of fierce hand-to-hand struggles while the commander of the Second Army was enabled to counter the moves of the enemy by the air reconnaissance reports which flowed in to him in a constant stream.

Efforts were made by No. 7 and No. 8 Squadrons to interfere with the flow of German reinforcements by bombing trains and railway centres. The aircraft they used, B.E.2cs, for the most part carried 20-lb. bombs of the same pattern as those dropped on the Zeppelin sheds at Friedrichshafen and elsewhere. It was not until October 1915 that a standard heavy bomb, weighing 112 lb., came into use, to be succeeded in its turn, in November 1916, by the 230-lb. bomb. Nos. 7 and 8 Squadrons were helped by four aircraft from the First Wing, one of which, piloted by 2nd Lieutenant W. B. Rhodes-Moorehouse, of No. 2 Squadron, dropped a 100-lb. bomb on the line west of Courtrai railway station. To make certain of hitting the target he came down to 300 feet and, therefore, into rifle and machine-gun fire, some of which came from the belfry of Courtrai church, almost on a level with his machine. After releasing his bomb he turned away and was immediately hit in the stomach by a bullet. He continued on his course and was again hit in the thigh and in the hand but reached his base at Merville, where he landed. He died next day from the effects of his wounds before he learnt that he was the first of the Royal Flying Corps to win the Victoria Cross.

The battle for Ypres continued with scarcely diminishing intensity up to May 24th, the Air Services co-operating not only in the air but also on the ground by means of Nos. 5, 6,

ARMoured CARS IN ACTION

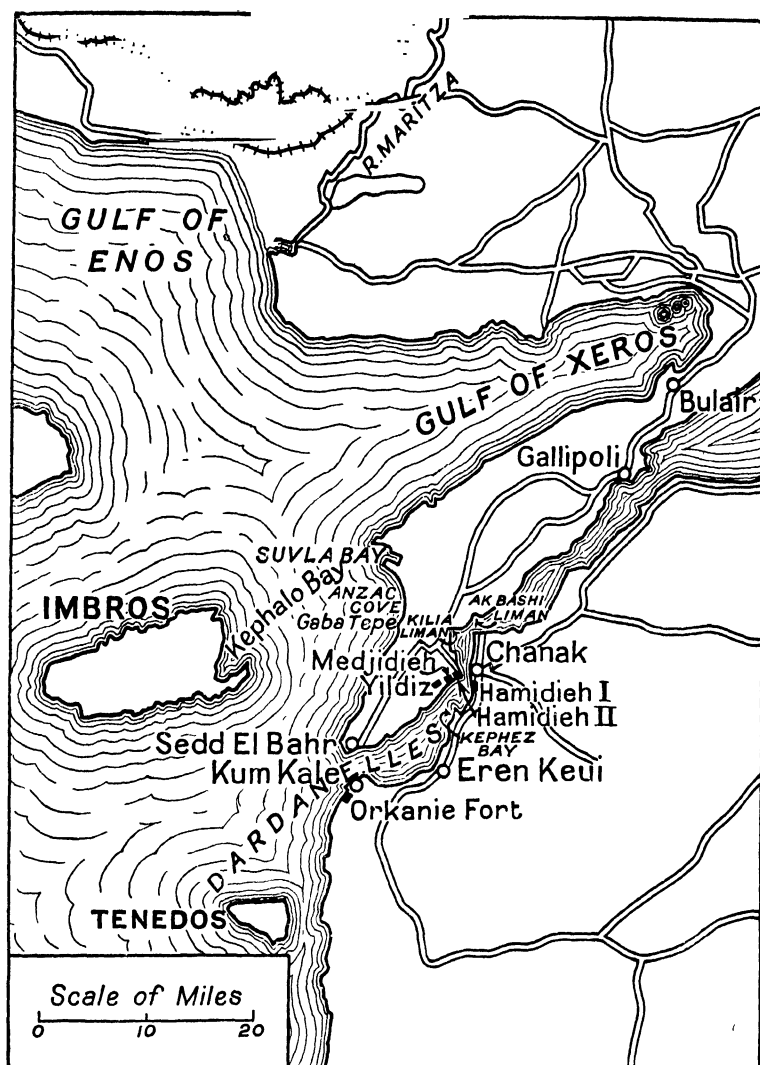
8, and 15 Armoured Car Squadrons which operated with the 3rd Cavalry Division. In this heavy fighting the exploits of two cars, 'Busy' and 'Bustler', were particularly noteworthy. In one attack they succeeded in getting to within a hundred yards of a German position and did great execution with their machine-guns. Towards the end of May the Germans were becoming desperate. All their attacks had either been held or the British withdrawal had not been large or far enough to make it possible to claim a decision. Their new weapon, to use which they had sacrificed the last pale shreds of humanity, had not proved decisive. They tried it once more on 24th May, drenching with gas the area east of Ypres. This attack was so severe that all means of communication was severed and only the armoured cars could be used to maintain contact with the front line. It failed like the rest and it was the last. When it died away the second battle of Ypres came to an end. Once more, at terrible cost, the British army had thwarted the German design, and in so doing had received considerable help from the Royal Flying Corps.

By this time that Corps had experienced several changes of organization; it was now divided into 'Wings'. The 1st, made up of Nos. 2 and 3 Squadrons and commanded by Trenchard, had been allotted to the First Army; the 2nd, composed of Nos. 5 and 6 Squadrons, was under Burke; and the 3rd was under Brooke-Popham. Thus, by the beginning of 1915, the principle of attaching Wings to armies had been adopted, but the grouping of the various squadrons was subject to more than one change, dictated by the changing fortunes of the battle. For the moment, the Royal Flying Corps must be left preparing for new adventures, of which aerial combat was to be the chief and the most remarkable. It is time to turn to the doings of the Royal Naval Air Service far away to the eastward against another enemy, the Turks.

6. The Royal Naval Air Service at Gallipoli

ON the 10th August 1914 two German cruisers, the *Goeben* and *Breslau*, hotly pursued by the squadron of Admiral Troubridge, sought refuge in the Dardanelles. They were allowed to pass unchallenged up the Straits, through the Narrows, and across the Sea of Marmora to Constantinople, where they were at once purchased by the Turkish Government. Since Turkey had been bankrupt for years, the transaction was worth no more than the paper on which it was recorded. The deal was put through by two soldiers of fortune, Enver Pasha and Talaat Bey, leaders of a band of unscrupulous and, for the most part, incompetent adventurers, who had decided to throw in their lot, and that of their country, with Imperial Germany. This purchase of the two German cruisers was the first of a series of moves of which the subsequent imitation has constituted the classical method for use by any country seeking by the arbitrament of war to prove its strength and importance. Enver and Talaat began by breaking their word. Though they had undertaken to place Turkish crews on board the newly acquired warships, they allowed the German officers and ratings to remain there and even to be reinforced. Their next step was taken on the 1st October when, without warning, the Turkish Government abolished the Capitulations guaranteeing the immunity of foreigners from the civil or criminal jurisdiction of the Turkish courts. A few days later the inevitable anti-British press campaign opened in all the Turkish newspapers. So plain had their intentions become, that by the 27th of that month a part of the British Mediterranean fleet had been concentrated at Tenedos. On the 29th Turkish warships entered the Black Sea and began to bombard Russian ports and by the last day of the month we found ourselves at war with Turkey.

There was then put into effect a decision of which the consequences, not foreseen at the time, were to prove very grave. On the 3rd November, the fleet weighed from Tenedos, moved to the Dardanelles, and fired for ten minutes upon the outer forts. This bombardment was intended, first and foremost, as a demonstration of British naval power and secondly as a method of determining the range and arcs of fire of the Turkish guns. Lacking air reconnaissance, the naval authorities did not realize at the time the severity of the damage caused. To the Turks, however, this attack from the sea was a sharp reminder of British power and they took immediate steps to strengthen the Gallipoli peninsula. 'I spent the rest of my time', said General Djevad Pasha, 'developing the defences.'



GALLIPOLI

These were formidable enough. As far back as 1906, plans to force them, in the event of war with Turkey, by combined naval and military operation had been discussed by the General Staff which had reached the conclusion that any attempt was 'much to be deprecated'. But that view had been expressed eight years before and the plans had long been reposing in a Whitehall pigeon-hole. Indeed, General Sir Ian Hamilton, the subsequent commander of our forces in the campaign, never discovered their existence till all was over. On the other hand, one man in the Cabinet, Churchill, still First Lord of the Admiralty, was strongly of the opinion that Egypt could best be defended by attacking her attacker. As early as 25th November 1914, he expressed this view at a meeting of the War Council, being careful at the same time to stress the great difficulties entailed by such an undertaking. It was not, however, until the 2nd January 1915 that any action, in the sense he had suggested, was seriously considered, and only then because the demand of our Russian ally for a second front had become insistent. On that day the Russian Government, under hard pressure from the Turks in the Caucasus, asked the Allies to attack Turkey proper. A demonstration was promised. The Admiralty were indeed prepared to go further for it had been assured by the man on the spot, Vice-Admiral S. H. Carden, that it would be possible in the space of a month to force the entrance to the Dardanelles and then proceed through the Narrows and the Sea of Marmora to Constantinople. Orders to do so were issued on the 13th January, but it was not until 19th February that Vice-Admiral Carden was ready. He had waited to collect a sufficient number of ships and, in particular, for one vessel which had not been commissioned till the 9th December 1914. She was the *Ark Royal*. It is the exploits of her aircraft, of the armoured cars of the R.N.A.S., and of the subsequent reinforcements which have now to be described. In so doing the movements of our sea and land forces are referred to only in so far as is necessary in order to make clear the part played by the forces in the air.

It will be remembered that four years previously a Short biplane had successfully taken off from the fore-deck of H.M.S. *Africa* while at anchor and feats similar to this had been performed in 1912 and 1913 from ships steaming as fast as twelve knots. Aircraft carriers were therefore a proved possibility. The first of them, the *Ark Royal*, named after the flagship of Lord Howard of Effingham in the days of the Armada, reached Vice-Admiral Carden on the 17th February. She was a little over 350 feet long, had a speed of about 11 knots, and a displacement of 7,450 tons. Her single hangar could hold ten seaplanes; she had a launching platform on the fore-deck, and was fitted with steel cranes and

workshops for the testing and repair of aircraft and engines. Unfortunately those that she held in her womb were, with one exception, far below the task which they were to attempt. They were six two-seater seaplanes and two single-seater land-planes. Of these only the Short seaplane, with a 200 horse-power Canton Unné engine, was really efficient. The others found it almost impossible to take off in a choppy sea and, even if they succeeded, they could only reach and maintain sufficient height for effective spotting as long as their engines gave no trouble. This meant that at best—when the weather was good—the fleet had at its disposal no more than six machines; at worse—when it was bad—only one, the Short, was of any use. The land aircraft could not operate for there was no aerodrome available on Tenedos and to make one required months of labour.

These were the obvious handicaps to success, but the *Ark Royal* was determined to prove herself if she could. Only three days in that month, the 17th, when she arrived, and the 19th and 26th, were suitable for flying; on all the rest, the sea was too rough. Her aircraft were, in consequence, in action within a few hours of the ship's arrival. Four seaplanes were put into the water but only one, a Wight, piloted by Flight Lieutenant G. R. Bromet and Flight Commander H. A. Williamson, succeeded in taking the air. In the evening light these two officers flew at a height of 4,000 feet over the forts comprising the outer defences—they dropped a 20-lb. bomb on one of them—discovered a number of mobile batteries and penetrated about four miles up the Straits. They were handicapped, as were all subsequent observers, by the inaccuracy of the maps depicting that part of the world. Nevertheless, their report amplified such previous intelligence as Vice-Admiral Carden had been able to collect. He felt justified in opening his attack on the 19th, and did so.

It began inauspiciously enough. Bromet and Williamson once more flew for an hour in perfect weather above the Fort of Orkanie on the Asiatic shore of the Straits close to the fabled tomb of Achilles. They sent out signal after signal. Nothing happened. Not a gun of H.M.S. *Cornwallis*, which was to begin the bombardment, opened fire. The reason was not a defective wireless transmitter but a defective capstan. So that her shooting might be as accurate as possible the *Cornwallis* had been ordered to anchor; this, because of the mishap to her capstan, she was unable to do. Her place was eventually taken by the *Vengeance*; but a precious, perhaps vital, hour had been lost. On landing, the officers in the seaplane reported that every gun in the forts of Orkanie, of Kum Kale, and of Sedd el Bahr was intact.

Nevertheless, the admiral was not dissatisfied with the morning's work and at 2 p.m. gave the signal to begin the second stage

THE OUTER SHELL IS CRACKED

of the operation, a close-range bombardment of what he hoped were by then severely shaken forts. It was to be followed by the sweeping of the channel leading to the entrance of the Straits. At first it seemed that the morning's bombardment of the forts had been successful, despite the air report that the guns had not been destroyed; but shortly before 5 p.m. the *Vengeance*, which had been ordered to cease fire and examine the damage, came suddenly under brisk bombardment both from Orkanie and from the fort at Cape Helles opposite. That fort was under bombardment by the *Inflexible* and two of the *Ark Royal*'s seaplanes were attempting to direct the fire, but without much success, owing to the defective nature of their wireless sets. At 5.30 p.m. the fleet drew off and that evening the weather broke, making all further operations impossible until the 25th February. On that day a greater success was achieved by the Navy, unaided by the seaplanes, which were prevented once again by the weather from taking off. The *Queen Elizabeth* and the *Agamemnon* put the only four long-range Turkish guns out of action and the enemy was observed to have abandoned the nearest forts. On the next day, therefore, after an air reconnaissance, landing-parties, put ashore at Kum Kale and Orkanie, destroyed a number of guns and this work of destruction was continued on the two subsequent days until most of the guns in this area had been blown up. Thus, by 1st March, the outer shell of the defence had been cracked. There were still, however, the far more formidable inner forts to be overcome.

In the meantime, the Turks had not been idle. They had been strengthening their defences by adding to them mobile 6-inch howitzers on both sides of the Straits to bombard those areas of sea in which the Allied warships would have to steam in order to get into the best position for action against the inner forts at Chanak, Hamidieh, Medjidieh, Yildiz, and elsewhere. An air reconnaissance on the 1st March disclosed these moves and another on the 4th confirmed them. It was decided that the best way to attack the inner forts was by indirect fire from the *Queen Elizabeth* across the Gallipoli peninsula from a position two and a half miles south-west of Point Gaba Tepe. Such fire, however, to be successful, had to be observed. A spotting vessel went as far as possible into Eren Keui Bay, but it was obvious that the men in the aircraft of the *Ark Royal* would be able to spot the fall of shot from the *Queen Elizabeth* far more accurately from high in the air than could any observer at sea-level. Were the seaplanes equal to this task? Given good weather it was hoped that they would be, and the weather on that March morning, the 5th of the month, was perfect. At 11.14 a Sopwith seaplane, with Flight Lieutenant W. H. Garnett and Flight Commander Williamson on board, took off, and presently reached a height of

MINE-SPOTTING IN THE DARDANELLES

3,000 feet. The Flight Commander was about to begin his observations when the propeller of the machine fell off. It at once plunged into the sea, from which its crew were rescued with some difficulty. That was the first mishap. Another was soon to follow. Exactly an hour later a second Sopwith seaplane took off and, like its predecessor, reached a height of 3,000 feet. For once the Sterling set, a primitive form of wireless equipment with which the Sopwith was fitted, was in working order. Sub-Lieutenant Dunning, the observer, was in the act of sending his first signal when his pilot was hit in the leg by a rifle bullet and so incapacitated as to make an immediate return to base inevitable. It was not until after 2 o'clock in the afternoon that the Sopwith got away again, but, by the time it had reached the target, visibility was becoming poor, and the *Queen Elizabeth* was soon compelled to cease fire. By then she had been hit seventeen times by mobile guns, and though her shells had done a considerable amount of damage, no gun in any of the forts had been put out of action. Whether or not a different result would have been achieved had the seaplanes been able to fulfil their function it is not possible to say. A badly made propeller and a well-aimed rifle shot had brought the experiment to nothing.

Three more days of desultory bombardment followed, and then the fleet drew off once more, and did not bombard again until the heavy attack of the 18th March was delivered. During the ten days of waiting, the seaplanes of the *Ark Royal* carried out many reconnaissances and were able to locate gun emplacements, the position of camps, and other details of military interest. Their main task, however, was to watch the Straits for the presence of mines, and minefield reconnaissances were flown every day from the 13th to the 17th March. In the area stretching from Kephez Bay north-eastwards to the Narrows, many mines were seen, but there appeared to be none west of the Bay. The pilots had practised mine-spotting by flying over a number sunk at various depths near the *Ark Royal*. These they had seen clearly, but it is one thing to observe a mine in quiet waters where its position is known beforehand, and another to make certain of detecting its presence in a narrow Strait, swept by fierce currents. In point of fact it was a minefield sewn parallel to the shore of Eren Keui, well to the south-west of Kephez Bay, which caused the heavy losses suffered by the fleet on the 18th March. To say with certainty whether the seaplanes should have spotted this minefield, is difficult; in any case the suspected area had been swept on the two nights immediately preceding the attack and no mines discovered. Daring and successful action on the part of some Turkish naval officers, who laid fresh mines in that area on the night of 17th-18th March, was the probable cause of the damage.

A LAND OPERATION IS PLANNED

The object of the naval attack next day was to silence the forts in the Narrows and thus permit mine-sweepers to deal by day with the large minefield in Kephez Bay, a task which had proved beyond their powers at night. Vice-Admiral J. M. de Robeck was now in command and he ordered the *Ark Royal* to send up a seaplane every hour to report the effect of the bombardment. The day was fine and cloudless, and by 10.30 a.m. the First Division of the fleet led by the *Agamemnon* entered the Straits. An hour later the bombardment opened, and an hour after that its progress was reported from the air. The observers found it very difficult to assess the damage, for the smoke was too thick. This was always happening and proved a frequent obstacle to accurate observation. They reported that four forts were in full action; but the next air reconnaissance showed that only one at Hamidieh, south of Chanak, was firing at all heavily. Its salvoes were soon concentrated on the *Irresistible*, which developed a list, presently struck a mine, and had to be abandoned. A similar fate befell the *Ocean*, but the *Inflexible*, also mined, struggled back to Tenedos. The French battleship *Bouvet*, however, suffered a worse fate. She, too, struck a mine and sank rapidly with a loss of more than 600 men. Two other French ships, the *Gaulois* and the *Suffren*, were also badly damaged. Faced with these losses, and rightly concluding that the area was still far too heavily mined, Admiral de Robeck withdrew. On this occasion spotting from the air had proved far more successful, but it had also shewn that nothing short of a direct hit could be relied upon to silence the guns of the forts.

Meanwhile, at home, the naval and military authorities were inclining more and more to the view that to force the Straits was too formidable a task for the Navy alone. By the 11th March it had been decided that the Army should take a hand, and General Sir Ian Hamilton was appointed to command a considerable body of troops to be used only 'in the event of the fleet failing to get there after every effort has been exhausted'. He reached Admiral de Robeck's flagship in time to witness the disastrous attack on the Narrows of the 18th March, and as a result he informed Kitchener on the next day that the Army would have to carry out a military operation 'in force in order to make good the passage of the Navy'. Admiral de Robeck was equally of that opinion, and Kitchener at once concurred. Unfortunately, however, the troops which Sir Ian Hamilton were to command were not ready. Their stores and equipment had, by some 'gross blunder' been wrongly loaded on the ships to take them to Alexandria; the most essential items were at the bottom of the holds, those least required at the top. A whole month was consumed in reloading the stores. In Egypt, every one worked very hard; but so also did the enemy

in Gallipoli. The English, General Liman von Sanders, was to say later, 'obligingly allowed us four good weeks of respite. This just sufficed for the most indispensable measures to be taken.' During those weeks, no one on either side worked harder than No. 3 Aeroplane Squadron of the Royal Naval Air Service, which, under Samson, its bearded and indefatigable Commander, had come to the Near East fresh from the hard fighting at Dunkirk and in Belgium, already described. By the last days of March the squadron, with eighteen aircraft of six different types, was installed in a makeshift airfield at Tenedos. Here they were somewhat more than seventeen miles from Cape Helles and thirty-one miles from the cove soon to be named Anzac. This was a formidable distance for the aeroplanes of those days to cover before reaching the scene of action.

It was decided to use No. 3 Squadron to reconnoitre the Straits, while the seaplanes of the *Ark Royal* were to fly farther afield. The first flight was made on the 28th March and, thereafter, machines of the squadron were over the Peninsula whenever possible up to 25th April, the day on which the army landed. Enemy positions were systematically plotted, the fall of shot from ships firing against enemy batteries was observed, 'crude but useful photographs of the landing beaches' were taken, and a map of the whole area prepared and kept up to date daily. On the 17th April an unsuccessful attempt was made to destroy by bombs a British submarine which had come to grief in the Straits and was in danger of falling into the hands of the enemy, and on the next day an enemy airfield, previously located near Chanak, was attacked and its main hangar destroyed by 100-lb. bombs.

In the meantime, the *Ark Royal* had made various small voyages in the neighbourhood, proceeding to the Gulfs of Smyrna, Enos, and Xeros. Her aircraft did much reconnoitring, and on the 16th, spotting for H.M.S. *Lord Nelson*, succeeded in blowing up an enemy magazine at Taifur Keui. On the next day she returned to her base at Mudros, where her aeroplanes awaited the moment for the infantry attack.

The task of spotting had by this time been taken over by the *Manica*, the first kite-balloon ship to be commissioned. She was a single-screw steamer of 3,500 tons with a maximum speed of eleven knots, and sailed from England on the 27th March, with a kite-balloon of the Drachen type, six trained officer observers, eighty-three ratings, and the necessary equipment which included 200 hydrogen cylinders. She arrived at Mudros on 9th April, and, after a series of rough-and-ready experiments, first went into action on the 19th. On that day, Squadron Commander J. D. Mackworth, one of a very small band of trained balloon observers, went up to spot for the cruiser H.M.S. *Bacchante*. Almost at

THE 'RIVER CLYDE' GOES IN

once he perceived a camp full of sleeping Turks, situated in a hollow, which, though out of sight, was within easy range of the cruiser's guns. Observation through glasses showed that there was no movement to be seen; even the sentries seemed asleep. 'The boom of the cruiser's forward turret,' he records, 'opened their eyes and a rude awakening followed when the top of a hillock some hundred yards beyond the camp was hurled into the air. No reveille ever blown commanded so instant a response.' A few salvos of 6-inch shell crashed down among the tents. The Turks fled in panic, and in a very short time 'of the once orderly camp nothing remained but torn earth and twisted canvas'. The *Manica* had proved an instant success, and other ships in Admiral de Robeck's fleet were immediately anxious to make use of her services. She played an important part all through the campaign, being reinforced in July by the *Hector*.

Something has already been said of the armoured cars belonging to the R.N.A.S. and the part they played in the campaigns of Belgium and Northern France in 1914-15. They were now to come into action against the Turks, and by the middle of April were at Mudros. Before using them on land, however, it was decided that their trained machine-gun crews could be of great value at that most critical juncture, the landing itself. Lieutenant-Commander J. C. Wedgwood with No. 3 Armoured Car Squadron was, therefore, placed under the command of Commander Edwin Unwin, R.N., with instructions to provide covering fire from eleven maxim-guns mounted on the fore-deck of the *River Clyde*, which was given steel and sandbag protection. This vessel, soon to win enduring fame, had been hastily prepared to play the part of what to-day would be known as a landing craft. She was, indeed, in a certain sense the gallant, shabby ancestor of those which in 1942 and 1943 went ashore at Dieppe and Oran, at Syracuse and Salerno. While Lieutenant-Commander Wedgwood was thus occupied, No. 4 Armoured Car Squadron, under Squadron Commander C. E. Risk, joined the Royal Naval Division who were to carry out a diversionary attack at Bulair, and No. 10 Motor Cycle Squadron, under Lieutenant-Commander A. E. Whalley, was held in reserve on board the parent ship, the *Inkosi*.

Shortly before 7 a.m. on the 25th April the *River Clyde* was run aground under heavy fire at Sedd el Bahr. The slope of the beach, more gentle than had been conjectured, at once upset the somewhat elaborate plans to form a flying gangway between the ship and the shore by means of a number of lighters. Heavy casualties were therefore incurred in an endeavour to make good the landing. The whole force would indeed have been wiped out had it not been for the machine-guns of the Armoured Car detachment, which, from the fore-deck of the *River Clyde*, raked

the Turkish trenches and machine-gun posts so fiercely and effectively that the sailors, struggling in the water to thrust the lighters into position, were able to work for more than an hour until at last they succeeded. Expertly and resolutely handled though they were, the maxims of the R.N.A.S. were neither numerous nor powerful enough to give that overwhelming close support fire which is vital for the achievement of success in that most dangerous of military operations, an opposed landing. It was not, however, for want of trying. Not only did the machine-gunners maintain the fight throughout the day, not allowing a single gun to be put out of action, but when night fell and the remaining infantry somehow struggled ashore, they laboured waist-deep in the tide to bring back the wounded. It was then that their doctor, Surgeon P. B. Kelly, unable to walk from a wound in his foot, caused himself to be laid on the shore where he attended to 750 casualties in less than forty-eight hours. On the 26th, four of Lieutenant-Commander Wedgwood's machine-guns joined the infantry and formed an important point in the defence of Sedd el Bahr village captured that morning.

In the meantime, the Australians and New Zealanders had secured a footing farther to the north at the famous Anzac Cove, where they held on, suffering very heavy casualties, until relieved on the 28th April by two brigades of the Royal Naval Division. Attached to them were some of No. 4 Armoured Car Squadron. For six days and nights their guns drove off all attempts to rush the position. Farther south at Sedd el Bahr, Wedgwood with his machine-guns had much to do on the 28th April, the day on which Ian Hamilton made his first general attack in the direction of the hill, Achi Baba. The fire of the maxims time and again held up fierce Turkish counter-attacks, both then and on the two following days. At one moment the Turks temporarily broke through, but were unable to maintain their advantage, largely owing to the work of these guns. From the 6th to the 8th May all the R.N.A.S. machine-guns took part in fierce Allied attacks. They were moved up and down wherever the fighting was heaviest. In those days maxims were above the price of rubies and the squadron continued to fight until the last week of May, when it was withdrawn and did not come into action again until the 4th June. By then its services could be of but limited use, for both sides had settled down to trench warfare.

While this heavy and heroic fighting was taking place on land the aeroplanes of No. 3 Squadron were almost continuously in the air. Their orders were to spot Turkish guns, and there was no difficulty in picking up targets, for the flashes gave away the positions of the batteries whenever they fired. Many tempting targets were signalled, but for a long time they were left

THE SUVLA BAY LANDING

engines choking with dust under the fierce wind. As for organization, Colonel Sykes was convinced that the R.N.A.S. would have to be more centrally grouped 'with regular channels of communication between it and Naval and Military Headquarters', and supplied with standard types of aircraft and adequate quantities of spare parts. He also decided that Kephalo, on the island of Imbros, would be the best base, for there the ground was level enough to permit the construction of two airfields, and the island itself closer than Tenedos to the troops on the Peninsula. He urged that a minimum of thirty-six aircraft, enough for two squadrons, half B.E.2cs and half Maurice Farman's, should be sent out with all possible dispatch, that a photographic section should be established, and that a fast trawler or tug, fitted with a derrick, should be available to salvage aircraft forced to come down on the sea. For co-operation with the Navy, Colonel Sykes demanded eight submarine scout airships, six two-seater and two single-seater seaplanes, and an additional kite-balloon section.

On his arrival in London on 12th July, he found a change of Government. Asquith had thrown over Haldane and relegated Churchill, the chief sponsor of Gallipoli, to the Duchy of Lancaster. Sykes's proposals were agreed to by the Admiralty, and on the 24th July he was appointed to command the R.N.A.S. units in the Eastern Mediterranean. To give him the necessary authority he was made a temporary Colonel-Commandant of the Royal Marines and a Wing-Captain of the R.N.A.S. with the seniority of a Captain in the Royal Navy of three years' standing.

Ian Hamilton was determined to put an end to the stalemate into which the campaign had developed, and in the pitch dark of the night of the 6th-7th August, a few hours after Sykes had reached his Headquarters, put 20,000 men ashore at Suvla Bay. The landing was unopposed; there were not more than 2,000 Turks in the neighbourhood, and there is little doubt that had the troops pushed forward immediately and seized Chocolate Hill and the ridge east of it, a resounding victory might have been achieved. Nothing, in fact, could have prevented a general advance, for the Turks had no reinforcements immediately available. In the event, what followed was a tragedy. The attack had been most carefully prepared, and much of the planning had been based on the air reconnaissances of Captain A. A. Walser and 2nd Lieutenant the Hon. M. H. R. Knatchbull-Hugessen. These had shewn, not only the whereabouts of trenches and gun emplacements, but the fact that they were unoccupied. Indeed, on the day before the landing, the officers were able to report that such Turkish troops as were visible were moving north-eastwards away from Suvla Bay.

Unfortunately, the attacking troops were commanded, not as

SEAPLANES OF THE 'BEN-MY-CHREE'

Ian Hamilton had requested, by a young and energetic General, but by Sir Frederick Stopford, who was both elderly and incompetent. The attack on Chocolate Hill, planned to take place at first light on the 7th August, was not launched until 5.30 in the afternoon. The ridge east of the hill was not attacked at all. Worse was to follow. Throughout the next day, Sunday, what remained of the defenders, a scattered battalion of Turkish gendarmerie, were preparing to retreat hastily before the overwhelming masses of the British, whom they expected to be any moment at their throats. No attack, however, came. To the astonishment alike of the enemy and of observers in the air, no movement was to be seen during the early morning. One of them, not unnaturally, concluded that we had pressed on even farther than he had expected, but his search beyond the known objectives was unproductive, and he returned, much puzzled, to make his report. By midday, other observers had at long last seen troops moving, but they were Turks. Mustapha Kemal was never of greater service to his country than on that day when he led reinforcements from the camp at Bulair and put them into position in time to repel the British attack which did not develop until the 9th at dawn.

During subsequent heavy fighting which continued until the 22nd August and achieved nothing but the sacrifice of a quarter of the Expeditionary Force, every effort was made by the R.N.A.S. to prevent the transfer of Turkish reinforcements across the Straits from Chanak on the Asiatic to Ak Bashi and Kilia Liman on the European side, the first serving the Suvla, the second the Anzac front. For this purpose, the seaplanes of the *Ben-my-Chree* made use of three methods. They spotted the fall of shot from a monitor which shelled transports *en route*, they bombed the harbours, and they attacked enemy shipping with torpedoes. Flight Commander C. H. K. Edmonds was the first man to torpedo a ship from the air, a feat which he performed on the 12th August. Flying from the Gulf of Xeros, he spotted a large vessel in the Straits, and, gliding to within fifteen feet of the surface of the water, he launched the fourteen-inch Whitehead torpedo he carried, at a range of three hundred yards. The ship was struck abreast the mainmast. It was soon afterwards discovered, however, that the vessel had four days previously fallen a victim to one of our submarines, and Edmonds had therefore done no more than make assurance doubly sure. Nevertheless, the attack was a portent. On the 17th August he repeated it with brilliant success, hitting the middle one of three steamers making for Ak Bashi Liman. His target burst into flames, and its burnt-out hulk had eventually to be towed to Constantinople. In this attack, Edmonds was accompanied by Flight Lieutenant G. B. Dacre, in another Sopwith, of which the engine soon gave trouble. Dacre was forced to alight, and began

ATTACKS ON THE TURKISH SUPPLY LINES

to taxi about looking for a target. A wave of his hand convinced the captain of a Turkish hospital ship, near which the seaplane had descended, that there was nothing to fear; but soon afterwards Dacre caught sight of a large tug, into which he put his torpedo. He then had to make a run of more than two miles under heavy rifle fire before he could coax his aircraft into the air. These attacks, which caused great consternation to the enemy at the time, were the forerunners of those which, a generation later, were to inflict mortal hurt on the *Bismarck* and the *Littorio*, and sink the *Prince of Wales* and the *Repulse*.

Three days later, Samson was so successful in directing the fire of Monitor M.15 that a munition ship was blown up in Ak Bashi Liman harbour, another was sunk, and heavy casualties caused among the Turks on shore. These cumulative misfortunes forced them to abandon the dispatch of reinforcements by sea. Such achievements are all the more remarkable if it is borne in mind that the range at which the monitors were firing was 18,000 yards, that there was all the time a heavy swell, and that several hills, more than a thousand feet high, stood between them and their targets.

Flour-mills, piers, coal depots, airfields, camps, working-parties, and troops on the march were the main targets for the bombs of the R.N.A.S. On one occasion, a vehicle was the objective. Samson, flying his Nieuport single-seater, spotted a motor-car behind the Anzac front. He had two bombs on board and, diving to the attack, dropped one, which exploded just behind the target, the occupants of which took to a ditch. Returning, his second bomb fell close enough to spray the car with splinters, but its occupants—one of them was Mustapha Kemal—were not hurt. It is, perhaps, idle to speculate what course history might have taken had one of those splinters struck home. So successful were these attacks in interfering with communications that, at one time, the Turkish troops were reduced to 160 rounds of small arms ammunition a man. With a larger air force it might have been possible to cut off supplies altogether. As it was, the enemy was compelled to rely almost entirely on the overland route.

By the beginning of September, some of the much needed reinforcements demanded by Sykes had arrived. They were No. 2 Wing, consisting of 16 pilots, 200 men, and 22 aircraft. The aircraft were not those for which Sykes had asked. By that time, the R.F.C. in France had first claim on all the best material available. Sykes was forced to be content with a motley collection, consisting of 20 seaplanes, Shorts and Sopwiths, and 40 aeroplanes varying between the B.E.2c with a 75 horse-power Renault engine and the Henri Farman with a 140 horse-power Canton Unné.

STAFF WORK FOR THE R.N.A.S.

Sykes had established his Headquarters at Kephalo, and set up an airship base at Mudros. He had many difficulties to contend with. At first, there were no spare parts, no instruments, no portable sheds, no transport, no motor-boats, no suitable flying clothes, no typewriters, and no stationery. There was also a shortage of trained staff officers. One of the main difficulties was the attitude of the army lines of communication staff living at Mudros. It was their duty to forward such supplies as they arrived, and they had constantly to be reminded of it. Theirs seemed to be a life of leisure and it was popularly supposed that their Headquarters, the *Aragon*, anchored in Mudros Bay, was so hemmed in by bottles as to be unable ever to put to sea.

In a very short time, the conduct of Sykes showed the wisdom of appointing a trained staff officer to command. He established a photographic section as part of the equipment of each Wing and ordered it to produce maps based on air photographs. These proved very reliable, and were used by both the fleet and the army. He set up wireless stations for receiving signals from aircraft, and visual signalling stations to communicate with the flagship. He created intelligence and meteorological sections. The officers and men of the R.N.A.S. seconded his efforts to the utmost of their power. They were willing and enthusiastic; indeed, had they not been so, life must have proved almost unbearable, for they lived in tents or huts of mud and stone in a country almost devoid of vegetation and, as autumn appeared, swept by violent gales. Throughout the summer the chief discomfort was the flies. They were everywhere. 'The tent poles were black with them and they could be killed by the thousand merely by applying a light.' Sir Ian Hamilton averred that they followed his fountain-pen and drank the ink as he wrote.

In conditions such as these, the R.N.A.S. settled down to face the autumn and winter of 1915. It was during these months that the Armoured Car Squadrons were gradually transferred to the Army. Many of the officers and men prepared to enter that Service with the guns they had fought so well; the rest, more especially the technicians, were attached to the aeroplane units.

By the end of August 1915, stalemate had descended once more on the armies. By then, Sir Ian Hamilton knew that he could expect no further reinforcements. Whitehall, however, were evidently still of the opinion that victory could be achieved by those tried and tested, gallant and disillusioned survivors of the expedition. Sir Ian was urged to hold on and did so, using his air force to attack Turkish communications. Things soon became much easier for the enemy, for in October, Bulgaria entered the war, and when, by the end of that month, her armies had freed

A VITAL RAILWAY BRIDGE

the Berlin-Constantinople railway by overrunning Serbia, Turkey was at last assured of the munitions of which she stood so much in need.

On the 5th November, the Admiralty urged the R.N.A.S. at Imbros to attempt the destruction of a vital railway bridge over which the tracks ran in their passage across the River Maritza south of Kuleli Burgas in Eastern Thrace. To cut the line at that point would interrupt communications from Berlin, not only with Constantinople, but also with Salonika. Samson led the first attack, on the 8th November, piloting a Maurice Farman, loaded with two 112-lb. bombs. He was accompanied by two of the *Ben-my-Chree's* Short seaplanes. Of the 180 miles which the aeroplane would have to cover in the round trip, 60 were over the sea, while all but 10 of the 120 miles to be covered by the seaplanes were over land. Samson bombed from 800 feet, missing the bridge by five yards; but he damaged one of its piers and by so doing delayed traffic for two days. Edmonds and Dacre, flying the seaplanes, missed the bridge but hit the track. That month the target was attacked five times more by day and once by night. The bridge was never hit, but damage was done to the embankments and to the permanent way.

Ferejik, some fifteen miles from the coast of the Gulf of Xeros, was another objective, and by the 1st December seventeen 112-lb. and twenty-four 20-lb. bombs, dropped in five attacks, had destroyed the main buildings of the south station. The attack delivered on the 19th November is memorable for the feat of Squadron Commander R. Bell Davies. Flying a single-seater Nieuport, in the company of Lieutenant G. F. Smylie in a Henri Farman, he approached the railway station, and together they dropped all but one of their bombs. Smylie's machine was hit by rifle fire, and he was compelled to land near the target. A number of the enemy made purposefully for him. As he was setting fire to his machine, he saw the Nieuport land close by on ground liberally strewn with rocks and boulders. Firing his revolver into his one remaining bomb, which exploded and destroyed the Farman, he ran to the Nieuport, climbed on board and, winding himself round the petrol tank—he was well over six feet high and the Nieuport was a small machine—was flown back to base. The report of Bell Davies was laconic: 'Returning saw H.5 burning in marshes. Picked up pilot.' For this exploit he was awarded the Victoria Cross.

By the beginning of November it was obvious that no decision could be reached at Gallipoli. Indeed, it was to be feared that the Turks, now beginning to receive all the munitions they needed from Germany, would presently be able to resume the offensive and drive our men into the sea. On the question of evacuation,

THE EYES OF THE ENEMY KEPT BLINDED

the Cabinet were divided, but a three-day blizzard of hail and snow which fell on the Straits in the last three days of November did much to settle doubts. Though Kitchener told the Prime Minister that he was 'haunted by visions of capsizing boats and drowning men', it seemed better to run this risk than to leave them exposed to death by cold and starvation. The men on the peninsula were always short of food and water and they had no greatcoats. Frost-bite and dysentery were widespread, and hospitals were soon full to overflowing. At Imbros, the Royal Naval Air Service were slightly better off, but planes and hangars had been badly damaged and all flying was suspended. The strain put on men and material was beginning to tell. 'Numbers had so dwindled,' says Sykes in his memoirs, 'that the two Wings, of which the normal complement was three squadrons each, could not muster sufficient planes to make two between them. . . . My demands for long-distance bombers and fighters had been ignored. Nine different types of machine had been supplied; there was no standardization, and spares were so short that parts of machines not yet erected had to be used.' To these misfortunes were added the instructions of the Admiralty which, on October 25th, ordered home all officers of No. 3 Wing who were not sick. Despite the protests of their commander, the order was enforced and all the experienced officers, including Samson and Bell Davies, left for England.

Orders for the evacuation of Anzac and Suvla were issued on December 8th. They were carried out on the 19th. Concentrating all his available strength—he was then reduced to fifteen air-worthy machines—Sykes maintained a continuous patrol during the 18th and 19th near the evacuation area. The withdrawal took place with complete success and, an even more remarkable event, the evacuation from Cape Helles three weeks later, on January 9th 1916, was also accomplished without loss. Here again, the R.N.A.S. kept every enemy machine away from the area during the vital period. 'Never,' says Sykes, 'was the paramount importance of command of the air more triumphantly vindicated than on this occasion', and he was right. The eyes of the enemy had been kept blinded.

After the evacuation, the R.N.A.S. remained for a short time at Imbros. It was during those few days that they incurred heavy casualties, losing between the 6th and 12th January, Busk, Black, Brinsmead, Boles, Bolas, and Branson, all save the last-named being killed. To the superstitious there seemed something fatal in the second letter of the alphabet.

So ended the campaign. The part played by the R.N.A.S., if at times a trifle more spectacular than that of the army ashore, was as strenuous and as gallant. They had fought with instruments ill-adapted to achieve success; seaplanes had often been

Altogether forty-two messages were received during the day. Unfortunately, however, German resistance was appreciably stronger than had been expected, and the attackers never reached the objectives assigned to them and so did not display the white strips. With the artillery, however, the Royal Flying Corps was more successful. Lieutenant C. B. Spence and his observer, 2nd Lieutenant the Hon. W. F. Rodney, directed the fire of many British and French guns on to a whole series of German batteries throughout a period of six hours until they were brought down and killed by anti-aircraft fire.

By the 10th May, the aspect of the battle had changed. The original objectives had been abandoned and the infantry were concentrated upon the village of Festubert though the actual attack upon this place did not begin until the 15th. It was launched soon after midnight and was not at first very successful. On the next day, good work was done by the Morane monoplanes of No. 3 Squadron, and one of them succeeded in directing a battery on to German reinforcements arriving in motor-buses. The German situation began to deteriorate and in the course of the next two days became precarious. Owing probably to lack of adequate information, the British did not press their advantage until the 20th, though an air report made in the early morning of the 17th had partially revealed the position of affairs. Then a curtain of mist fell across the battle-field. Had it not done so, it is possible that the British attacks would have been successful, for this solitary and incomplete air report would have been followed up by more detailed reconnaissance. This the misty weather prevented and the fight died away after the 24th, by which time the British had advanced no more than 600 yards on a front of four miles. 'The battle, aimed to take a bite at the enemy lines, had resulted in no more than a nibble.'

A lull then occurred during which the results achieved by bombing between March 1st and June 20th were subjected to a close analysis. They were seen to be most disappointing. Only 3 out of 141 attempts to hinder the movements of enemy troops by bombing railway stations and other objectives were found to have succeeded. It was therefore decided that, in future, bombing operations should be directed only at enemy headquarters, telephone exchanges, ammunition and poison gas dumps. On August 7th, the British and French air services reached the conclusion that the only effective way to use bombs was to drop them on railways, if possible in a cutting. To carry out this policy with success, it was realized that as great a weight as possible of bombs should be dropped and it was therefore agreed that both forces should act in the closest co-operation. This policy of co-ordinating the British and French efforts marked a distinct

A PRIMITIVE FORM OF BOMBSIGHT

advance in the development of air warfare and was to prove of value a month later in the battle of Loos.

About that time the first primitive form of bombsight, produced largely through the efforts of 2nd Lieutenant R. B. Bourdillon and Lieutenant Strange, made its appearance. It was known as the Central Flying School bombsight and was at once adopted by the R.F.C. and the R.N.A.S. Even to-day the problem of hitting a target with a bomb from a moving aircraft has not been entirely solved, though the Sperry and Norden bombsights in use by the American Army and Navy Air Forces have reached a very high degree of accuracy. 'Bombs are not "projected"—that is, thrown—but "released"—that, is dropped. Moreover, they fall from something which is not stationary but moving at a high speed. The bomb at the start, therefore, has the same speed and direction as the aircraft. Air resistance acts as a brake, but its effect is not great. The bomb does not fall vertically but moves forward as well as downward in a curved path. . . . The wind has little effect on the flight of the bomb once it has left the aircraft, but an important influence which affects bombing is the strength and direction of the wind in which the aircraft is flying. This must be exactly calculated.' These words which set out the problem confronting the bomb-aimers of Bomber Command in the war which began on the 3rd September 1939, can be applied with equal truth to the war of 1914-18 and, since in those days the instruments available were far more primitive than those evolved a generation later, the results were correspondingly less satisfactory.

On the other hand the battles of Neuve Chapelle and Festubert achieved a very fair degree of co-operation between the observers in the air and the gunners on the ground. In this field, progress was relatively swift though unco-ordinated and therefore unequal. In the attack on Hill 60 in April 1915, for example, No. 1 Squadron evolved a most efficient method of signalling the appearance of a suitable target. The observer sent an agreed signal 'JJ' followed by the appropriate map reference. 'JJ' meant 'I see a good target of the nature of a battalion, a battery on the move, or transport over a hundred yards long. All guns please engage it.' But this system was not universal and did not become so until a conference, held in June of that year, produced a pamphlet which formed the basis of co-operation between the air service and the army throughout the battle of Loos. It was soon to be tested in action. In those days, ammunition for the guns was scarce or, to use a modern and curious specimen of English, 'in short supply'; it was essential that not a round should be wasted. On the 16th June, Captain B. T. James of No. 6 Squadron, discovered no less than fourteen enemy batteries in action and by means of his

BOMBING THE RAILWAYS

messages enabled our artillery to engage eleven of them simultaneously.

Between the battle of Festubert and that of Loos, a series of desultory actions, of which the most important was the brilliant attack by the 6th Division near Hooze on 9th August 1915, took place with varying results. In all of them the R.F.C. played an increasingly important part. On the 19th August, somewhat more than a month before the opening of the battle of Loos, Henderson handed over his command of the R.F.C. to Trenchard. Henderson returned to England where his great technical knowledge and experience was put to full use in organizing the vast expansion of the air force then beginning to take place.

The battle of Loos was planned as a subsidiary affair, an auxiliary attack to be made in conjunction with the main autumn offensive entrusted to the French and due to take place in the bare rolling country of Champagne. The First Army, under Sir Douglas Haig, was to advance between Lens and La Bassée, and secondary attacks, designed to pin the enemy down, were to be carried out by the Second Army east of Ypres. There was still a great shortage of ammunition and this made the task of the R.F.C. in finding targets and spotting the fall of shot all the more important. The bulk of the work fell on the First Wing commanded by Lieut.-Colonel E. B. Ashmore. It is not too much to say that the whole programme of artillery bombardment was made to depend on the observations by eye and by camera carried out by the aircraft of this Wing. Dividing up the positions to be attacked into four zones, they worked from morning to night communicating the results of their observations to no less than forty wireless ground stations.

The bombardment opened on the 21st September and on the 23rd the bombing programme against the important railway triangle, Lille-Douai-Valenciennes, was put into operation. It was carried out by the Second and Third Wings and was on the whole encouraging: 31 aircraft of these Wings and 3 from No. 12 Squadron bombed the railways on that day and a goods train near Somain received a direct hit from a 100-lb. bomb dropped from 200 feet. Two days later, several hits from as low as 150 feet, were scored on bridge and railway lines. On the 26th, in bad weather, two ammunition trains were hit at Valenciennes, twenty trucks loaded with shells exploded and all traffic in this vital junction was suspended at the very height of the battle. This was the best achievement in six days of bombing carried out in thick and rainy weather. Altogether 82 100-lb., 163 20-lb., and 26 incendiary bombs totalling nearly $5\frac{1}{2}$ tons were dropped for the loss of two aircraft. The farthest penetration was 36 miles behind the German lines. These $5\frac{1}{2}$ tons fell on 15 targets, destroying or

partly wrecking 5 trains, a signal box, and a number of sheds at Valenciennes. Despite these achievements, however, an examination of the German archives shows that all units sent to reinforce the front reached their destination on time. A far heavier weight of bombs would have been necessary to stop them.

Rain set in on the 24th and was still falling on the morning of Saturday 25th, when the infantry went over the top. Once more, as in previous engagements, poor visibility prevented the First Wing from demonstrating to the full the capabilities of air power. Pilots flew low over the battlefield, but the heavy smoke of the bombardment mingling with the clouds of British gas, then used for the first time, prevented them from seeing much of the fighting. Nevertheless by 8.15 a.m. the whereabouts of forty-two enemy batteries had been discovered and signalled to the guns. After that the fog of war descended in full measure. At no time was precise information available to the Commander-in-Chief and the artillery commanders which would tell them the exact position of their attacking troops. In the late afternoon, spent and weary, these had reached a position somewhat short of the Lens-La Bassée road and had there begun to dig in. Unknown to them, and for the moment to the enemy, there was a gap of more than a mile to the left of Loos between Chalk Pit Wood and the village of Hulluch. Moreover, immediately to their front between that village and Cité St. Auguste, the Germans were very weak; parts of their trenches were completely empty. Had both the gap beyond Chalk Pit Wood and the thinness of the defence between Hulluch and Cité St. Auguste been observed from the air, the whole course of the battle might have been changed. The fact was that the importance of flying low over the enemy to observe his exact dispositions had not yet been realized.

Once more, as at Festubert, attempts were made to indicate the presence of the attacking infantry by means of ground strips and, in addition, yellow smoke candles. They were entirely ineffective. It was obvious that a much more elaborate system, accompanied by exact and careful training, would have to be adopted before the men on the ground could make sure of being able to disclose their whereabouts to the men in the air.

Important for these and other reasons as was the battle of Loos, it is chiefly memorable, as far as the air is concerned, for the development of aerial combat which then first began to assume serious proportions. For the first year of the Four Years War, air fighting was of a most primitive kind. As early as September 1914 a number of Maurice Farmans belonging to No. 4 Squadron had been fitted each with a Lewis gun. Since this aeroplane was of a 'pusher' type, the gun, being mounted forward, had a very wide field of fire. The machine, however, was altogether too slow

DEVELOPMENT OF AIR FIGHTING

to be of any use. At that time the vital importance of speed in air fighting had scarcely been dreamed of. The weapon used in the earliest combats was the rifle and, as might be expected, the results it achieved were small. On the 5th February 1915 a German Aviatik was shot down near Merville from a range of 50 feet. Another suffered the same fate on the 15th April near Elverdinghe. Often, however, in those early days the airmen of both sides were content in default of any effective offensive armament, to live and let live. 'We were taking photographs of the trench system to the north of Neuve Chapelle,' says Lieutenant W. Sholto Douglas, observer to Lieutenant Harvey-Kelly, 'when I suddenly espied a German two-seater about 100 yards away and just below us. The German observer did not appear to be shooting at us. There was nothing to be done. We waved a hand to the enemy and proceeded with our task. The enemy did likewise. At the time this did not appear to me in any way ridiculous.' These halcyon days soon vanished.

As the war developed it rapidly became obvious that neither side could afford to allow the other a glimpse of its dispositions or the whereabouts of its batteries if this could in any way be prevented. The question was how. Speed was evidently a vital factor. That being so it was obvious that the fastest machine must be chosen as the fighter. In the Royal Flying Corps the two which best qualified were the Bristol and Martinsyde Scouts. They had, however, one great disadvantage. They were tractor aeroplanes and the problem of mounting a Lewis gun to fire forward was therefore one of great difficulty, so much so that several ideas which now seem fantastic were tried. It was thought that a pilot could manœuvre his aircraft so as to place it immediately above the enemy machine and then drop upon it small incendiary bombs or a shower of steel darts. Another device was a weight at the end of a 150 feet of cable which, it was hoped, would become entangled in the enemy's propeller; a third, a bomb on a string, which should be hooked to the enemy plane and then exploded electrically. Such devices, which would have delighted the White Knight, rarely reached even the stage of experiment. The solution appeared to be the Lewis gun if only it could be mounted effectively. It was soon found that its cooling apparatus could be dispensed with; indeed the difficulty was to prevent the oil from freezing.

While efforts to fit the gun to tractor Scouts were being made, the most effective of them being to fix it on the top plane high enough for its bullets to clear the tips of the propeller, a 'pusher' fighter, the Vickers F.B.5 made its appearance. No. 5 Squadron received a number of these aircraft early in 1915 and on the 10th May one of them shot down a German machine close to

Lille. They were still too slow, however, nor was the engine, a 100-h.p. Monosoupape, very reliable.

By 21st May 1915, our reconnaissance aircraft were being attacked with some degree of determination and casualties began to mount. From then onwards combats in the air were on an ever-increasing scale to the end of the war. The R.F.C. riposted with vigour and by 31st July had won two more V.C.s, one being awarded to Captain J. A. Liddell of No. 7 Squadron on the 31st July, the other to Captain L. G. Hawker of No. 6 Squadron, four days later. Liddell, badly wounded, fainted and, on coming to, succeeded in pulling his R.E.5 out of a three thousand feet nose dive and then made a crash landing, thus saving the life of his observer. He died of his wounds a month later. Hawker, flying a Bristol Scout, destroyed three German aircraft in one evening.

In the last resort, victory must fall to the side which could produce the faster, more manœuvrable and better armed aircraft. At first the advantage was with the Germans. At the end of July 1915 the famous fighting Fokker monoplane made its appearance. Though it was a tractor its machine-guns fired straight ahead through the propeller. The problem of the interrupter gear had been solved and it was the Germans who solved it. The Fokker fighter, ancestor of the Fokker-Wolfe 190, revolutionized air warfare. It was the first machine to be armed with fixed guns and thus to establish a new principle of air fighting which has endured ever since. Its pilot aimed the aeroplane at his adversary, for he was in fact in control of a flying gun and the method of its handling was the genesis of fighting tactics. Its pilots patrolled at a considerable height and then, on seeing a British or French aeroplane, dived upon it out of the sun, in imitation of the hawk, and delivered a long burst of machine-gun fire all the longer because its fixed guns were fed by belted ammunition.

The German air ace, Leutnant Max Immelmann, showed peculiar skill in handling Fokkers. He invented the turn bearing his name, by which the aircraft, when almost at the top of a loop, turns sharply sideways and resumes an even keel pointing in the opposite direction. This manœuvre proved singularly effective—at first, and German aggressiveness throughout the beginning of winter became marked. Combats were frequent and many were to the advantage of the enemy. By that time our reconnaissance machines were beginning to receive fighter escort and this afforded them a certain measure of protection. A combat on the 29th December is typical of activities about this time. Lieutenant Douglas on a B.E.2c was unable to prevent a similar machine he was escorting from being shot down near Cambrai. He fought his way back against four Fokkers and at times was forced down

to within fifteen feet of the ground. Winter gales, wind, and rain prevented reconnaissance on the scale desired by the Army; so also did the activities of the Fokkers.

By the middle of January 1916, the R.F.C. had begun to suffer heavily from the attacks of a superior aircraft, resolutely and skilfully handled. The counter to it was the introduction of formation flying. An order of the 14th January, which frankly admitted the superiority of the German Fokker, laid it down 'as a hard and fast rule that a machine proceeding on a reconnaissance must be escorted by at least three other fighting machines. These machines must fly in close formation and a reconnaissance should not be continued if any of the machines become detached. . . . Flying in close formation must be practised by all pilots.' Various types of formation were tried. The practice, for example, in the Second Wing, was for the reconnaissance pilot to lead the formation with an escort 500 feet above him on each quarter and a rear-guard a thousand feet above. On 7th February 1916, a formation of this kind successfully fought off repeated attacks from fourteen German aircraft though the pilot of one of the escort machines was mortally wounded. Such tactics had, however, one great disadvantage; they notably reduced the number of aircraft available for both the short and long reconnaissance flights now demanded by the Army. Indeed so serious was the threat of the Fokker that, on one occasion, no less than twelve fighters were detailed to escort one reconnaissance machine. It was high time that British aircraft designers delivered a counter-stroke.

Their first answer to the Fokker was two 'pusher' type of aircraft, the F.E.2B and the D.H.2, both produced by Geoffrey de Havilland. The advantage of the F.E.2B was, not only its relatively fast speed secured by 120 h.p. Beardmore engine, but also its spacious cockpit from which the observer had a wide view. Not only could he fire forward, but by means of a special mounting he could cock his Lewis gun backwards over the top plane so as to engage enemy aircraft attacking from astern. The D.H.2 was a single-seater with the very high speed for those days of 86 miles an hour. The first F.E.2B squadron to reach France, No. 20, arrived on 23rd January 1916, the first D.H.2 squadron, No. 24, on the 8th February. This was the first squadron of the R.F.C. to be composed exclusively of single-seater fighters.

On the 25th April, two of the D.H.2s beat off many Fokker attacks and showed their mettle, and by May it seemed that their equality with, if not their superiority over, the Fokker was well established. On the 23rd May, General Sir Henry Rawlinson, commanding the Fourth Army was able to report that 'we have successfully photographed the whole of the enemy's trenches . . .

THE STRUGGLE FOR AIR MASTERY

over a front of more than twenty miles without being once attacked by the Fokkers. This was done on the 15th, 16th, 17th, and 18th May and clearly shows that for the moment at any rate we have command of the air by day on the 4th Army front.' Our Allies, the French, has also been active in finding an antidote to the Fokker and soon produced a small single-seater fighting tractor aeroplane, the Nieuport Scout, powered with 110-h.p. Le Rhône engine and armed with a Lewis gun fired over the top plane by means of a Bowden cable. It was flying one of these aeroplanes that Albert Ball, one of the great fighting pilots of the Four Years War, whose career will be referred to later, achieved his first successes.

By the spring of 1916, preparations for the great Somme offensive, which it was hoped at that time would not only relieve the German pressure on Verdun, but also achieve victory before the autumn was out, were in full swing. The struggle for the mastery in the air had swayed to and fro for more than six months. Now at the opening of that great battle, it was temporarily at any rate, secured by the Allies. This result was due as much to the superior strategical use of aircraft as it was to the greater efficiency of the machines. General Trenchard and Commandant du Peuty of the French Air Service were between them developing a common policy to be used by the British and French which was to have a decisive effect on the whole conduct of the war. The principle they decided to follow was the old one that the best defence is attack. In other words all the air forces available should be used to 'carry the war into enemy territory and keep it there' and not be dispersed in penny packets, so to speak, to guard the numerous targets vulnerable from the air to be found in and behind the Allied lines. A sharp-eyed child who swots the wasp attacking his jam obtains a momentary advantage which may enable him to finish his tea in peace; but it is the gardener who pours a kettle of boiling water into the wasp's nest who achieves the real victory. Though not entirely accurate that analogy may serve to illustrate the strategy of Trenchard, and he was steadily supported by his French colleague who had reached the same conclusion from a study of the heavy fighting before Verdun in February 1916. In that fierce and deadly struggle, the French Air Service had clung to the strategic offensive. Leaving their infantry without immediate air cover, they repeatedly attacked German machines wherever they were to be found and to do so had penetrated deep into the German lines.

The Germans, on the other hand, had adopted the tactics of the policeman. They patrolled the battle zones, which they divided up into a series of beats, and instructed their pilots to prevent any hostile aircraft from breaking through. These tactics

FIGHTER STRATEGY

they called the 'barrage' system. They soon proved quite ineffective. Aeroplanes, which should have been used for reconnaissance or bombing, were diverted to this purely defensive work and were neither numerous nor powerful enough to prevent a determined effort to pass through them. Realizing their mistake the Germans concentrated a number of their best aircraft, the Fokkers, into two special groups attached to the Headquarters of the German 5th Army. They were known as the Fighter North and Fighter South Commands and were imbued with the great offensive spirit of Lieutenant Oswald Boelcke. In association with Max Immelmann he soon began to achieve results; the French were forced back on to the defensive and thus lost the advantage—but not for long. In their turn they realized the necessity in air warfare of maintaining a continuous offensive. They returned to it and regained their superiority. What Lieutenant Boelcke accomplished against the R.F.C. will be told later.

All this and much more was noted at Flying Corps Headquarters situated since 30th March at St. André aux Bois near Montreuil. In the opening months of 1916 Trenchard decided that all fighting aircraft should be concentrated in the Wings attached to each army. By then the R.F.C. had been reorganized into brigades, each equipped with an aircraft park and a kite-balloon squadron, and attached one to each corps. Trenchard extracted the fighters from the brigades and by the middle of August there were no fighters with the corps squadrons. The principle of keeping separate fighting, that is the maintenance of the offensive, from the air work demanded by the corps, which was mainly reconnaissance, had at last been firmly established and was maintained to the end of the war.

8. Spirit of Attack

The Somme Battles

BEFORE the part played by the R.F.C. in the battle of the Somme is described, it is necessary to say a word concerning the Observation Balloons which had by that time hung for weeks behind the lines of the opposing armies. As far back as March 1915, Sir John French had asked for a supply of these indispensable aids to artillery observation. At that time, all lighter-than-air craft were in the hands of the Admiralty, which at once placed a Kite Balloon Section at the disposal of the Army. It was allotted to the V Corps, and was first in action over Poperinghe on the 25th May.

The best, indeed almost the only method, of discovering the position of hostile guns was by observing the flash when they fired, and it was soon evident to the enemy that this method was being very successfully used by observers swaying in the baskets beneath the balloons. From the first, therefore, they were the objects of attack and had constantly to be shifted from one site to another. Another Balloon Section reached France on the 26th June and took up a position near its predecessor on the 1st July, exactly a year before the opening of the battle of the Somme. In the summer of 1915, the Polo grounds at Roehampton were taken over for a Balloon Training Centre, and in the autumn of that year the R.F.C. assumed full responsibility for the balloons used on the Western Front. It was not, however, until the battle opened that the War Office began to place contracts for their manufacture.

While observers in aeroplanes were able to spot a larger number of batteries and were capable of operating under weather conditions which made the flying of balloons impossible, balloon observers did useful work at night and, since they were connected by telephone with the artillery, could send swifter and more detailed messages than those in aeroplanes who had to rely on wireless. By July 1916, a long line of kite balloons, stretching the whole length of the battle-field, was in position on both sides of the trenches. The observers beneath them, keyed to the highest pitch, began their part in the struggle eight days before the infantry advanced to the attack. Disaster nearly fell upon them at the outset, for the balloons of the Fourth Army front were struck by lightning in a fierce thunderstorm which broke out at 3 p.m. on Friday the 23rd June. The balloon of No. 5 Section was torn from its moorings and sped rapidly before the fierce wind in the

COUNTER-BATTERY WORK

general direction of the German lines, presently reaching a height of 13,000 feet. The occupants of its basket, 2nd Lieutenants J. W. Jardine and G. D. S. M. Pape, tore up their notes, maps, and photographs, and when the balloon entered a heavy snow-storm, accompanied by thunder and lightning, gave themselves up for lost. Almost immediately, however, their balloon began to fall and a counter-current drove it back across our lines. By then, the parachutes to which the officers were attached had been loosed from their cases and had opened. Jardine cut his away in time, but Pape was less fortunate and, as soon as the balloon lost buoyancy, was torn from the basket, and found himself hanging above the envelope, along the deflating bosom of which flames were beginning to flicker. Very fortunately, before they had burnt through the guide-ropes which had become firmly entangled with his parachute, the whole contraption fell to earth near Arras. Both officers escaped with their lives, though Pape was badly frost-bitten. Two days later, a determined effort was made to destroy the balloons of the enemy. Fifteen out of twenty-three were attacked, four were brought down by rockets, and one by a phosphorus bomb. The next day, three more were destroyed by the Nieuport pilots of No. 1 Squadron.

For the battle of the Somme the R.F.C. had worked out a new system of tactics, based on the experience gained at Neuve Chapelle, Festubert, and Loos. First, and of paramount importance, was the aid which the air could render to the guns. The heavy fighting which had eventually mastered the Fokker, was to make it possible for artillery observation machines to play a vital part in the forthcoming battle. 'Counter-battery work . . . has been steadily growing in importance and is now an essential element . . . in offensive operations', ran a pamphlet issued by the General Staff in January 1916. This view was fully corroborated by the enemy. Commenting on the fighting at Verdun, Hindenburg stated that 'to engage the enemy's artillery with the help of aeroplane observers is the principal and most effective means of fighting a defensive battle to a successful conclusion. Should this succeed, the enemy's attack is absolutely paralysed.' This had long been understood by the R.F.C., which worked out a system of the closest co-operation with the guns. Programmes for shoots were drawn up by the artillery officer in command, in consultation with his opposite number in charge of the air squadron, and air observers were required to discuss their day's work in detail with the battery commanders. Accurate co-operation was not achieved overnight; it took weeks and months, not from any lack of willingness on the part of either arm, but because much practice and a general resort to the system of trial and error were necessary. One great difficulty was the ease with which

PHOTOGRAPHIC INTERPRETATION

wireless messages from spotting aeroplanes were jammed by similar messages simultaneously emitted by friendly adjacent aircraft. A remedy was found by the adoption of the 'Clapper-Break,' by which the pitch or the tone of the note sent out by the aeroplane could be varied. This simple device made it possible to double the number of aircraft used for spotting in any given area, and by the time the battle opened, wireless aeroplanes, in the proportion of one to every 2,000 yards of trench-line, could operate with the artillery without the risk of finding their signals jammed.

Mention has already been made of the system used at Loos for calling on the artillery to engage a sudden target. This was developed, notably by Major E. R. Ludlow-Hewitt, and by June 1916 a zone system had been introduced. Each zone, covering 3,000 square yards, had a two-letter call consisting of the letter denoting the square on the map, followed by that denoting the zone. Thus, the observer could at any moment call for zone fire by one short, speedy message. A special emergency artillery scheme had been tried out in February 1916, and by the 1st July had been perfected. On receiving the message 'general artillery action', squadrons were required to send their aircraft to carry out a pre-arranged programme of artillery co-operation and reconnaissance. When 'situation normal' was signalled they were to return to routine work.

By the end of the battle of Verdun, great strides had been made by the French in the development of air photography; nor were we slow to follow. So great, however, were the demands for air photographs that by the spring of 1916 the Photographic Units attached to the Wings became overburdened and serious delays began to occur. By April, therefore, each Corps and Army reconnaissance squadron was allotted a small photographic section. Under this arrangement, the Corps staff was responsible for all photographs within five miles of their front, the area beyond being dealt with by the Army Wing. It began to be realized that air photographs revealed a great deal more than had previously been suspected. Those appointed to study them soon became expert in interpreting the information given by shadows, which told the relative height or depth of an object appearing on the print. Tracks and ammunition lines showed up well and provided a valuable guide to the movements of enemy troops. The straightness and narrowness of trolley-lines frequently betrayed their presence and they provided useful targets for the guns, especially at night. It may, indeed, be said that the science of photographic interpretation, if that is not too high a term for what is far more than a useful accomplishment, owed its first development to the battle of the Somme.

COMMUNICATION WITH THE GROUND

It will also be remembered that efforts had been made to find some easy way by which the attacking infantry could make known their positions to observers in the air. Here again, at Verdun, the French armies had worked out a reasonably effective method, and this was embodied in a general instruction issued by Joffre on the 17th April 1916. It was used as a basis for the British contact patrol organization, first employed on the Somme. Aeroplanes with distinctive markings were detailed to carry out tactical observation of the battle-field and to perform no other task. When their pilots, flying low, made the signal 'Where are you?', usually by means of a Klaxon horn repeating a succession of As, the infantry were to reply by lighting flares. Some of them carried metal mirrors on their backs, the flash of which, it was hoped, would have much the same effect as a heliograph. Battalion and brigade headquarters were to signal by lamps and signalling panels, made of large shutters of six or eight laths painted white on one side. These could be jerked up and down by means of tapes, and so used to spell out a message which could be read from a height sometimes as great as 6,000 feet.

A change in bombing tactics also took place before the battle. Bombing groups were gradually increased in size from 14 to 31 (23 bombers and 8 escorts) and attacks were synchronized with ground operations, so that munition depots and railways were not bombed until the crucial moment when even a comparatively short interruption in the supply of shells or in the traffic on railways would affect the immediate course of the battle. Trenchard also began to develop night bombing, the first serious attempt being made on the night of the 19th-20th February 1916 by two B.E.2cs of No. 4 Squadron.

Finally, the problem of repair and supply was tackled. The original Aircraft Park was expanded, and a second park established at Candas with direct communications to Rouen. Parks were also set up for the First Army at Aire, the Second at Hazebrouck, and the Third at Beauval, and three months' supplies of spare parts and stores kept at each of them. A huge mechanical hospital for the repair of engines was created at Pont de L'Arche near Rouen. By the spring of 1916 equipment officers, whose duty it was to concern themselves with all questions of supply and repair, had been allotted to most squadrons, thus relieving the Squadron Commander of much technical office work.

The battle of the Somme was the first of those battles of attrition by which the Allied High Command sought to exhaust the enemy and leave him without sufficient strength to withstand their final assault. Three weeks before Christmas 1915 Joffre, Haig, and their advisers had held a conference at Chantilly at which it was decided that the British Army should mount an

offensive in the course of the following summer. Its main object would be to compel the Germans to draw heavily upon their reserves. When these had become depleted, then the French Armies were to deliver the *coup de grâce*. Unfortunately the enemy got his blow in first by opening in February 1916 an attack on Verdun which he sustained until well into August. By then it was the French reserves which were on the point of exhaustion—though the Germans were also in very bad case. By then, too, Pétain, commanding the defence, had been pressing for some time for the assumption of the offensive by Haig. Only if the British Army were to attack and continue to attack would German pressure on the French be reduced. This view was shared alike by the Governments and the General Staffs of both countries, and every effort was made to hasten the preparations necessary for an onslaught larger than any which up to that time had been made by a British Army. It was to be sustained as long as possible on as large a scale as possible, and it was confidently hoped that its unrelenting ferocity would so weaken the enemy that he would be unable to parry the thrusts to be delivered by the French in the spring of 1917, which would thus prove to be the final blow.

The Fourth Army was to bear the brunt of the initial attack and was to advance on positions about Bapaume and then southward to Ginchy. The capture of these positions, combined with a French advance on Sailly and Rancourt, would, it was hoped, breach the whole enemy front between the Somme and the Serre. To enlarge it the attack was then to be switched against Blaireville and Ficheux. When these had been captured the whole line was to move forward towards Cambrai and Douai. For the Fourth Army's support in the air, 109 aeroplanes were allotted to it, in addition to the Ninth Wing consisting of 58. There were also 18 B.E.2cs of No. 8 Squadron detailed to support a subsidiary attack on Gommecourt. All Corps squadrons, with the exception of No. 3, which flew Moranes, were equipped with B.E.2cs. These Corps aircraft were to be afforded continuous protection by the Army squadrons and by offensive sweeps carried out by De Havillands.¹ In all, 27 squadrons, consisting of 421 aircraft and 4 kite balloon squadrons with 14 balloons, were detailed for the battle. As will be seen, the Royal Flying Corps had grown considerably. At the battle of Loos there were but 12 air squadrons in France. There were to be more than double that number for the Somme, and they were better equipped, better trained, and better armed.

The superiority in the air which they immediately achieved

¹ For the Order of Battle of the Royal Flying Corps on the 1st July 1916, see Appendix IV.

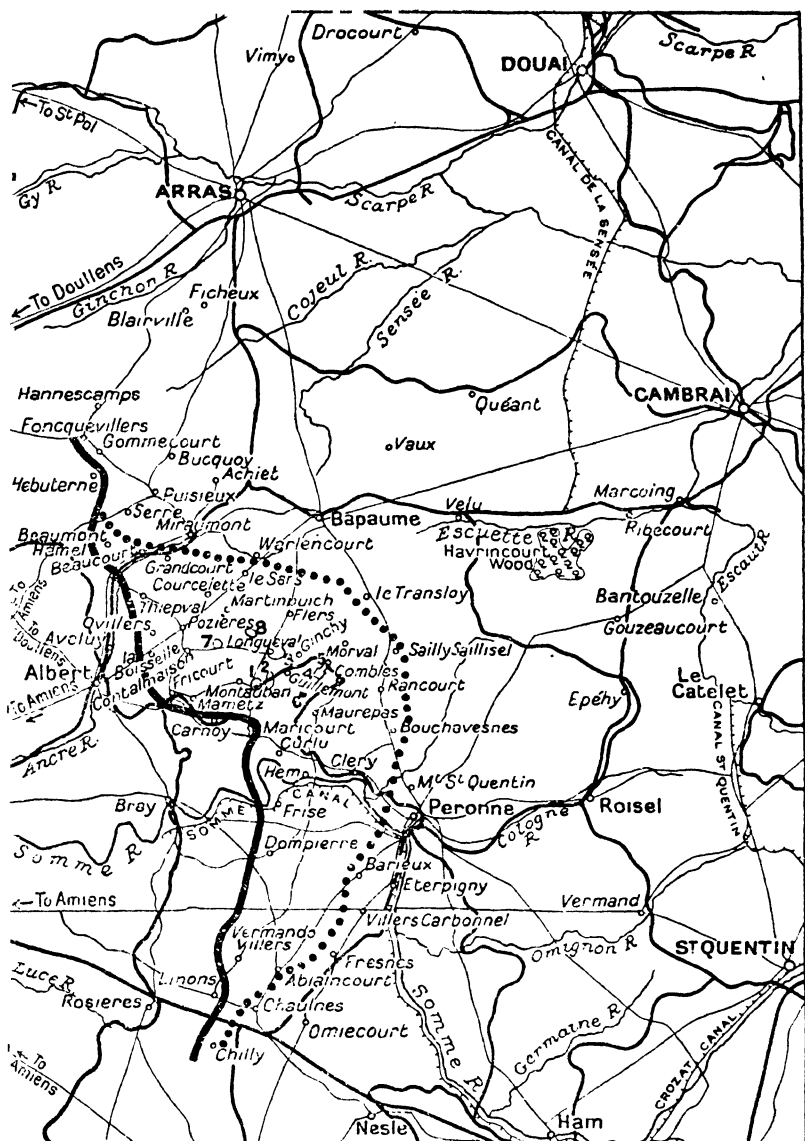
THE SÔMME BATTLEFIELD

over the German Air Force was for the moment absolute. Alike over the front line and over the back areas as far as twenty-five to thirty miles in the German rear, the R.F.C. ruled the air and allowed no attempt at dethronement to pass without a challenge. The broad result was the discomfiture of the foe everywhere. At the front 'the infantry,' said a German officer, 'had had no training in the science of defence against low-flying aircraft, and, moreover, had no faith in their ability to shoot these machines down'; while farther back the enemy's artillery was forced to fire on targets unobserved from the air and therefore very often impossible to plot with accuracy. All this, however, was in the immediate future. While awaiting an onslaught which he had long been expecting, the enemy had not been idle. He was, however, outnumbered. To the 27 squadrons mobilized against him he could at first oppose a total of only 129 aircraft. Before three weeks were out, however, these had been substantially reinforced.

Thirteen days before the opening of the battle, the German Air Force suffered a heavy loss. About nine in the evening of the 18th June, 2nd Lieutenant G. R. McCubbin and Corporal J. H. Waller, flying an F.E.2B of No. 25 Squadron, encountered three Fokkers over Annay. One dived away, and the two others made for another F.E. nearby. As they dived upon it they came within the range of McCubbin and his gunner. A burst of fire sent one of the Fokkers to the ground. Its pilot was the famous Max Immelmann.

To understand the battle of the Somme it is necessary to keep an eye on the map. Roughly speaking, the Somme valley, since Roman times a battle-field, runs athwart any army attacking Paris from the north. The Somme river flows first south from Ham to Péronne and then westwards towards Amiens. Seven miles before it reaches that city it is joined by the River Ancre, a name for ever famous in the annals of the British Army. The country between these two rivers, over which the battle was to be fought, is a series of monotonous uplands, varied by shallow valleys. Villages and towns are grouped round the deep wells which are a feature of this part of France. Beneath the top soil is a belt of chalk, of which the Germans took full advantage, for it made the construction of underground defences, in many cases well deserving the name of labyrinth, comparatively easy. Superimposed upon the chalk is a layer of clay and loam in which, before 1916, grew many woods and copses. These were destined to earn undying fame—Mametz, Railway Copse, Fricourt, Bernafay, Trônes, Delville, Bazentin, High Wood—all are names in the splendid, tragic litany of the Somme.

The battle-field over which the Royal Flying Corps was to fly



1 Bernafay Wood 2 Trones Wood 3 Delville Wood 4 Leuze Wood 5 Bouleaux Wood
 6 Falfemont farm 7 Bazentin Wood 8 High Wood
 ——— Roads ——— Railways
 ——— Line on June 30th 1916
 Line at close of Battle
 Scale of Miles
 0 5 10 15

THE BATTLE OF THE SOMME 1916

stretched from Hebuterne and Beaumont Hamel in the north-west to Péronne in the south-east; the River Ancre cut it roughly at right angles, first passing through the village of Hamel and then running north-east through Beaucourt and Miraumont. Upon its left bank there was the whole series of complicated defences round Thiépval, Mouquet Farm, the Leipzig Salient, Ovillers, La Boisselle, and, a little farther to the south-east, Fricourt. Moving farther east, there were the villages of Mametz, Carnoy, Maricourt, Curlu, Hem, and Cléry, the two last just ahead of the Somme Canal. All these places were heavily entrenched and closely defended by the enemy, many of whose positions were on high ground, which enabled them to overlook the British lines. Moreover, they were served by a complicated network of roads reaching villages soon to possess nothing but their imperishable names—Pozières, Martinpuich, Flers, Longueval, Montauban, Guillemont, Ginchy, Combles, and many more. It was against the positions held by the enemy in these and many other strong points that on Saturday the 1st July 1916 the British Army advanced.

On that morning, aircraft of the R.F.C. were in action as early as 4 o'clock, but mist prevented accurate observation, and it was not until 6.30 that observers in the air were able to judge the general effect of the furious bombardment which preceded the infantry attack. This was due to begin one hour later, but before that moment thin lines of British infantry were observed leaving the forward trenches and moving into no-man's-land ready to begin the assault. When the final barrage opened, the spectacle from the air was remarkable. 'The enemy lines,' says Cecil Lewis, who was over them that day, 'were under a white drifting cloud of bursting high explosive. The shell-bursts were continuous, not only on the lines themselves, but on the support trenches and communications behind.' This furious fire was, as far as the R.F.C. was concerned, by no means an unmixed blessing. 'At two thousand feet,' says the same authority, 'we were in the path of the gun trajectories, and as the shells passed, above or below us, the wind eddies made by their motion flung the machine up and down as if in a gale. Each bump meant that a passing shell had missed the machine by four or five feet.'

The main attack was to be preceded by a subsidiary at Gommecourt on the extreme left of the line, to be carried out by the 46th and 56th Infantry Divisions assisted by No. 8 Squadron of the R.F.C. The attackers were to light red flares, but for some reason or other they failed to do so, and the R.F.C. could identify them only by the colour of their uniforms. This meant flying very low and, therefore, being subjected to rifle and machine-gun fire. Nevertheless, no aircraft was lost, though one, on the way back

to report, ran into a balloon cable and spun to earth without injury to the pilot or the observer. The infantry attack was a tragic failure. Men of the 46th Division reached the northern corner of Gommecourt Wood, but observers from the air had before long to report that the German infantry in the front line, who had sheltered in deep dug-outs, had reoccupied their trenches after the passage of the British troops. Attacked from the rear, these were all soon killed or captured. Farther to the right and to the south of Gommecourt, the R.F.C. saw the infantry fight their way through the first and second lines of the defence till they reached the third, where they were heavily counter-attacked. Desperate fighting throughout the late morning and afternoon produced no other result than the reoccupation by the Germans of all that they had been compelled to concede in the morning.

Nor was the left flank of General Rawlinson's Fourth Army more successful. It attacked in the Serre-Thiepval area, having as air support Nos. 15 and 4 Squadrons. Some of the infantry drove through as far as the Schwaben Redoubt towards Grandcourt, and an observer of No. 4 Squadron reported in the afternoon that he could see German batteries retreating in some confusion. The British infantry had won a redoubt known as the Crucifix, but the village of Thiepval, heavily fortified, was still in German hands. It was reconnoitred from 600 feet by Captain C. A. A. Haïtt, but his report made it clear that it was too strong to be attacked, and in the night our hard-working, more than decimated infantry were compelled to withdraw. The advance a little farther south and to the right was slightly, but not markedly, more successful. No. 3 Squadron, co-operating with the III Corps, reported that the infantry were held up at the village of Ovillers and La Boisselle, but that north of Fricourt a certain gain had been made. By the evening, the 7th Division, whose movements had throughout been reported from the air, had progressed somewhat beyond Mametz.

The least unsuccessful achievement of this tragic, bitter day was the advance, reported by No. 9 Squadron, of the 30th and 18th Divisions in the direction of Montauban. A German battery, which essayed to shell the advancing British infantry at Bernafay Wood, was attacked by machine-gun fire from the air, and was put out of action for some time. The British infantry, who had now entered Montauban, were still advancing over the ridge beyond the village. They were greeted by enthusiastic gestures from Captain J. T. P. Whittaker and 2nd Lieutenant T. E. G. Scaife, who, flying above them, had followed their progress with the keenest and most resolute attention. The scene is a vivid one: in the bright clear light of a summer morning a line, broken and irregular, of stumbling eager figures moving forward over drab,

a heavy battery to disperse in disorder under the shells of our guns. A column of the enemy moving up towards Guillemont, and later that evening a German battalion near Ginchy, sustained casualties amounting to half their effectives, from shelling directed by observers from the air.

On Friday the 14th July, a new phase of the Somme offensive opened by a general attack on the German second line, running from Longueval to the wood of Bazentin le Petit. The attacking forces had been well supplied with information concerning the disposition of the German troops. Their lines had been photographed and reconnoitred in detail by pilots who had flown over them and returned more than once, their machines riddled by bullets. The assault made in the early hours of 14th July took the enemy by surprise, and was at once successful; so much so that an observer of No. 9 Squadron was able to report at dawn that the 3rd Division were fighting at Bazentin le Grand itself. So elated were G.H.Q. by this and other reports, that cavalry were brought up in readiness to pass through the gap which it was hoped had been torn in the German defence. To exploit what they believed to be victory at last, the British High Command sent an aeroplane over the German line with orders to send out the following message which, it was realized, would certainly be picked up by the German wireless: 'Enemy second line of defence has been captured on a front of 6,000 yards. British cavalry is now passing through in pursuit of the demoralized enemy.' This flamboyant and deliberately inaccurate estimate of the situation was broadcast at 10.30 a.m. In the evening, a few cavalry units advanced a short distance. The 7th Dragoons and the Deccan Horse went forward shortly before sunset, but Captain A. M. Miller, flying a Morane monoplane of No. 3 Squadron, had seen that the Germans were posted in the standing crops ready to repel the advance. Flying up and down their position, he engaged them with Lewis gun fire, and then dropped a sketch-map giving their position, which was of great use to the men on the ground. Co-operation between the air and the cavalry was productive, at least, of this result: the slaughter by the spears of the Lancers of no less than sixteen Germans, and the capture of a further thirty-two. This achievement cost 'no more than two officers and a hundred men'.

For the next few days the R.F.C. put in a number of low-flying attacks, many of them carried out by No. 22 Squadron, using a new form of tracer ammunition invented by Mr. F. J. Buckingham of Coventry and adopted some months earlier by the R.N.A.S. These attacks were made to help the infantry fighting around High Wood near Bazentin le Petit, and, later on, those of the III Corps engaged in the attack on Pozières. Here, an observer

reported that the preliminary bombardment, though wrecking many buildings, had done little harm to the German defence. Nevertheless, the attack was delivered; its failure was in the circumstances scarcely surprising. The second attack, due to be launched on the 18th July, was cancelled as the result of an air observer's report stating that the defences of the village had been greatly strengthened 'with new machine-gun emplacements and barricades'.

By then, the first phase of the battle of the Somme was over. As far as the air was concerned, it had been made clear that co-operation between the Royal Flying Corps and the attacking infantry was of great, indeed of vital, account. Despite the difficulties of signalling to low-flying aircraft by means of flares and other devices, it had been possible to report with considerable accuracy, the progress, if progress it can be called, of the infantry on the shell-torn ground. 'The reports of contact observers leave no doubt . . . that most information could be obtained by direct observation from a low height, and that any uncertainty as to the nationality of the troops could usually be set at rest by going low enough to draw fire.' The R.F.C. did not hesitate to do so. At all times, particularly in bad or doubtful weather, the pilots went down to as low as 300 feet in order to be sure that they would be able to spot the whereabouts of the infantry. This they did repeatedly under heavy machine-gun and rifle fire from the ground, directed at aeroplanes of which the maximum speed did not reach ninety miles an hour. It is, therefore, a remarkable fact, worthy of record, that no contact aeroplanes were actually shot down, though a very large number received so many hits that, on landing, they were judged unserviceable. The only aircraft actually destroyed in the air was one hit by one of our own shells during an artillery barrage.

Co-operation with artillery was now seen to be of the utmost value. In Bailiff Wood, for example, fourteen gun emplacements, holding thirteen guns, were totally destroyed as the result of air observation, and the Chief Artillery Officer of the 32nd Division could report 'that the German artillery on our front has been in great measure destroyed by our aeroplane observation for heavy artillery'. The gunners were loud and generous in their praises of the Royal Flying Corps. The Artillery Commander of the XIII Corps, writing to the Commanding Officer of No. 9 Squadron, observed that 'the results obtained were entirely due to the gallant efforts of your observers and pilots'.

The results achieved by the R.F.C. were, in fact, twofold. In the first place, by observing and photographing the positions of the enemy they enabled the attacking infantry to know in considerable and accurate detail exactly what they were up against.

GERMAN SQUADRONS REINFORCED

They also made it possible for our own artillery successfully to engage many targets, including the guns of the enemy. By flying low over the German infantry they not infrequently put them into a state of confusion. 'They were seized,' says a German officer, 'later on, with a fear almost amounting to panic, a fear which was fostered by the insistent activity and hostility of the enemy's aeroplanes.' The R.F.C. were also an invaluable contact between the troops in the front line and the Divisional, Corps, and Army Headquarters in the rear. The second, and equally important service which they rendered, was in the successful efforts which they made to deny the air to the enemy. No German aircraft bombed the advancing British infantry, and very few German batteries had the advantage of an aeroplane to observe their fire. In a word, in this first phase the R.F.C. achieved complete local air superiority.

The next phase of the land battle, the struggle for the main ridge running from Hamel in the west through Contalmaison, Longueval, and Ginchy to Combles in the east, lasted until the 13th September, and was marked by a change for the worse in the situation in the air. Faced by the superiority of the R.F.C., the Germans put forth a great effort. Their front was reinforced, notably by two new fighter squadrons, and by the third week in July a total of 164 German aircraft, not counting those in reserve, were in operation along the front of the German First Army, running from Hannescamps almost to Péronne.

To understand the air fighting, it will be convenient first to describe the R.F.C.'s co-operation with the Army, and then its direct offensive against the German Air Force carried out by bombers and fighters, though these phases occurred simultaneously.

On the ground, in order to relieve the situation at Delville Wood and Longueval, it was essential for our right flank to move farther forward and capture Guillemont, Falfemont Farm, Leuze Wood, and then the village of Ginchy and Bouleaux Wood. To the fierce reaction of the enemy, however, was now added the complication of bad weather. Not only did a German counter-attack, delivered on the 28th July against Delville Wood, hold up an equally determined British attack on Longueval, but mist prevented adequate air co-operation. Through it, contact aeroplanes obtained infrequent and uncertain glimpses of shadowy figures and flares marking the places where desperate men fought desperately in the torn and stinking remnants of Delville Wood.

The enemy made full use of the mist to hide the reinforcements which he was bringing up to strengthen his threatened positions, and attempts by Nos. 3, 4, 9, and 34 Squadrons of the R.F.C. to discover his movements were only partially successful. A general attack was planned for Sunday, the 23rd July, but it was not

22 July 1916

NEW GERMAN DEFENCE LINES

until the morning of Saturday the 22nd that 2nd Lieutenant T. S. Pearson, observer to Captain C. H. B. Blount, came into the Headquarters of the III Corps to announce that, diving out of the mist at dawn, they had found a new trench-line running parallel to our forward positions between Bazentin le Petit and High Wood. It was immediately realized that this information must alter the whole design of the attack, for the enemy were now known to be nearer and in greater strength than had originally been estimated. New plans had to be made; such was the value of air reconnaissance. A long irregular gash of newly turned earth, seen by trained eyes in the sparse sunshine of a misty September morning, was more than enough to warn those in command on the ground of that sudden change in the dispositions of the enemy, which, if undetected, has in a hundred battles meant the defeat of the attacking force. Nevertheless, despite the change of plan and a heavy bombardment, lasting for six hours and a half, the advancing infantry could make little or no impression upon the stubborn defence, save at one point near Pozières. The attack was renewed on the 24th, and again on the 25th at dusk, when, once more as the result of an air report from No. 34 Squadron, the gallant III Corps concentrated the whole weight of its assault on a length of trench known as Munster Alley, the key to the German position covering Martinpuich. The R.F.C. had again been able partly to disclose the efforts of the enemy to strengthen his threatened position, but it was not until the weather cleared on the 28th, and air photography could be resumed, that its real strength was revealed. Then, at last, was seen the full intricacy of the new lines of defence, which, to quote the Commander of the III Corps, 'accounted for the obstinate resistance to any considerable advance up Munster Alley'. Had those photographs been available earlier, the attack would have been of a different nature and might, indeed, never have taken place.

Not only did the bad weather affect the help which the R.F.C. could afford the troops in the front line, but its co-operation with the artillery was equally hampered. The Artillery Commander of the III Corps, for example, was unable to counter the heavy shelling of the enemy by engaging his batteries, because he did not know their whereabouts. This state of affairs 'must go on,' he said, 'as far as one could see, until the weather clears and the mist goes'. Three days later the R.F.C. had succeeded to a certain extent in piercing the veil, and the situation was somewhat easier. By the last day but one in July, the problem which had faced the Army Commanders on the 18th still subsisted; the enemy was still obstinately preventing them from swinging forward their right flank. A determined attempt to do so on the 30th, by attacking Guillemont and Falfemont Farm, though beginning well, ended

INCIDENTS OF FRONT-LINE FLYING

in failure. Its progress was reported in great detail by No. 9 Squadron, and it repeated this performance nine days later, on the 8th August, when the attack was once more renewed with that indomitable gallantry and general lack of success which were the main features of the Somme battle.

It is impossible within the scope of a short account to go into further details. Let it suffice that every attack on this, as on other centres of enemy resistance throughout those days of bitter fighting, was reported almost continuously by the R.F.C. The tributes paid to them by the struggling, heroic infantry were many and deserved. On the 18th August, for example, the Commander of the decimated III Corps commented with gratitude on the accuracy of the reports which he had received from the air, giving information of yet another attack on Guillemont, while four days later the Australians of the I Anzac Corps praised the skill in photography displayed by No. 7 Squadron.

The nature of the services which, in those days, the R.F.C. was able to render, is illustrated by various incidents which occurred about this time. There was the discovery by 2nd Lieutenant E. O'Hanlon and Sergeant H. L. Pateman, on the 13th August, of the preparations for a German counter-attack near Mouquet Farm. It was destroyed by artillery fire before it could be launched. There was the message from 2nd Lieutenant F. E. S. Phillips of No. 3 Squadron, who, on the 24th August, prevented our artillery from shelling our own men by giving an exact report of their whereabouts. There was the attempt by a naval airship, the S.S.40, painted black, to carry out a reconnaissance on the night of the 28th-29th August. 'Little of value was reported,' since, for safety's sake, she was ordered not to fly lower than 8,000 feet. There was the grim and correct conclusion reached by an observer of No. 3 Squadron on the 3rd September that the Germans, over whom he flew at a very low altitude near Ginchy, were corpses, 'because of their utter lack of movement'. There was the assistance rendered on the 3rd September, by 2nd Lieutenants E. R. H. Pollak and T. E. G. Scaife of No. 9 Squadron to some fifty men of the Royal Warwickshire Regiment, who were huddled in a shell-hole near Falfemont Farm, under heavy machine-gun fire. The airmen found its origin, quelled it, and enabled the troops to advance.

The constant support given by the R.F.C. to the Army, and prevented only when the weather made flying out of the question, had been made possible only by Trenchard's policy of attacking the enemy's Air Force far over his own lines, and of bombing his communications sufficiently often to force him to set aside a high proportion of aircraft for their defence. Air attacks on German billets and supply dumps were a constant irritation to

BOMBING THE ENEMY'S BACK AREAS

the enemy. The bombs carried were either two 112-pounders or eight 20-pounders, and the attacks were made mostly by No. 27 Squadron flying Martinsydes, No. 21 Squadron with R.E.7s, and No. 19 Squadron with B.E.12s. The target area was round Bapaume and Péronne, the main objectives being Le Transloy, Sailly-Saillisel, and Le Barque. There were also the two main railway lines leading to the German front. Here the principal targets were situated at Marcoing, Epehy, and Vélú, while the railway stations at Bapaume and Cambrai themselves came in for much attention. The enemy soon began to react vigorously, and combats were frequent. A target of special importance was Havrincourt Wood, where enemy reserves were often concealed. The Martinsydes of No. 27 Squadron went farther afield, as far as Mons on the 28th July, Namur on the 3rd August, and Cognelée, where airship sheds provided a peculiarly suitable target. Maubeuge was also among the objectives. Only one of these long-range aircraft was lost in a series of raids lasting more than a month.

Meanwhile, north of the Ancre the air squadrons of the III Brigade, Nos. 8, 12, and 13, were engaged with equal vigour on a bombing offensive. This took the form, in July, of a series of attacks on Bapaume. They were covered by the patrols of the fighters of Nos. 11, 23, and 60 Squadrons, and the fierce nature of the fighting can be deduced from the casualties suffered by the last-named, which lost its Commander, two Flight Commanders, three pilots, and two observers, in less than a month. Many of these raiders were intercepted by Fokkers and combats were frequent. It was in these that Albert Ball began to distinguish himself. On the 22nd August, for example, flying a Nieuport, he disposed of three German aircraft, and a week later repeated this performance.

Not only were billets, dumps, and railways attacked; the offensive was equally directed against the aerodromes of the German Air Force, notably those at Douai, Quéant, Bertincourt, Beaucamp, and many others. How much damage the 112- and 20-pounders did it is hard, writing more than twenty years afterwards, to say, but the effect was undoubtedly to cause confusion and prevent German aircraft from taking off. Their destruction was achieved by fighting them in the air. For this purpose, offensive patrols carried out by the Army Wings were flown with great frequency from five to ten miles behind the German lines, while other squadrons from Headquarters carried the offensive still farther. The Sopwiths of No. 70 Squadron, for example, equipped with the new Scarff Lewis gun-mounting, in addition to a fixed gun firing through the propeller, did much useful work. For the first three weeks of the battle, combats were infrequent, but once the

THE FIERCE FIGHTING OF AUGUST

German Air Force had been reinforced, fighting flared up. It broke out with violence on the 21st July, the day on which No. 32 Squadron, flying De Havilland Scouts, first came into action on the Somme. It had arrived to reinforce the other fighter squadrons, of which No. 24 particularly distinguished itself that day. Its first patrol fought five Rolands and five Fokkers, dispersing them all and destroying four; its next, that evening, accounted for five out of fifteen German machines. This was a typical day's fighting during a period when air combats were frequent whenever the weather was clear enough for flying. It was at this time that our pilots learnt much. The old days of taking snap shots at the enemy with a rifle, or trying to get close enough to him to shoot him with a revolver, were over and done. Now the Vickers or the Lewis gun was as indispensable a part of the aeroplane as was its engine. New tactics were constantly being worked out, alike by ourselves and by the enemy. The first air 'aces', of whom Ball was the prototype, began to make their appearance.

Fighting was fierce and to our advantage all through August, notably on the 6th, 16th, and 22nd. On that last day, No. 70 Squadron, on a long reconnaissance, returned with no more than thirty rounds of ammunition left between all the machines. Ball, who destroyed three Germans on the 16th, broke up a formation of twelve Rolands near Cambrai on the last day of the month, and reached our lines in safety after his engine had been damaged by bullets. Despite the arrival of more German air reinforcements, the battle was still in our favour in the early days of September, and the R.F.C. continued to dominate the front. Many combats took place, that of Captain L. P. Aizlewood of No. 32 Squadron being, perhaps, the most remarkable. On the 9th September, flying a de Havilland, he dived with such determination upon his German opponent that he struck its tail; this carried away his propeller and under-carriage, but he succeeded in making a safe landing; the German machine crashed.

Before the middle of the month the German High Command was seriously concerned. Its new Commander, Field Marshal von Hindenburg, who had succeeded General von Falkenhayn on the 28th August, decided that a determined effort must be made first to dominate and then to destroy the R.F.C. Hauptmann Oswald Boelcke, who had scored a brilliant, if momentary, success against the French over Verdun, was summoned to lead a new squadron, equipped with the Halberstadt and the 'D' type Albatros, then the fastest and most deadly fighting-machines in the world. More will be told of him later.

The third and last phase of the long-drawn-out battle opened on the 15th September. On that day, forty-nine tanks, the first ever to come into action, assisted the attacking infantry. They

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THE THIRD PHASE BEGINS

were a new, but not an entirely secret, weapon, for a German kite balloon observer had seen and reported the movement of some of them on the afternoon of the 14th, less than twenty-four hours before they went into action.

The military plan was, as usual, ambitious. The Fourth Army was to break through between Morval and Le Sars, and this success was to be followed up by the cavalry. The Reserve Army, shortly to be known as the Fifth Army, was to capture Courcellette and the high ground north-east of Thiépval. It was once more the task of the R.F.C. to afford the fullest co-operation, especially by frequent contact patrols, and thus enable the Army Commanders to receive swift and accurate information of the advance. For hours during the night which preceded the assault, R.F.C. aircraft flew up and down the German front lines, the roar of their engines drowning the noise made by the tanks as they moved into their assault positions.

The attack was launched at 6.20 a.m. on the 15th, and by the end of the day No. 7 Squadron was able to report that the Canadians had captured Courcellette on the right. Blount and Pearson of No. 34 Squadron, who had saved the situation at High Wood on 23rd July, had once again to play an important part in the attack on the same grim obstacle. They soon reported that uncut wire and machine-gun fire were preventing any advance. Of the three tanks supporting the infantry one had been ditched before leaving our own lines, one was leaning up against a tree, and the third was in flames. After dropping their report on Headquarters, these officers returned, and once more reviewed the battle-field. The British infantry had struggled forward and were now manning a more or less continuous line. The airmen reported this in person to Corps Headquarters, where they were informed that an immediate frontal attack on the German position was being organized. 'This,' said Pearson, 'will mean the wiping out of the attacking force, for the enemy trench-line is manned literally shoulder to shoulder; there are machine-guns every few yards and most of the wire is uncut.' He went on to explain that since the British infantry had pushed ahead on each side of High Wood, it would appear that the German garrison were in a hopeless position. He was right, and what was more important he was believed, for by this stage reports from the air were being treated with the respect they deserved. The attack was called off. Blount and Pearson flew for a third time over the position, and by 1 p.m. were able to report that the German garrison of High Wood had surrendered. Pearson died of tuberculosis in 1924, and Blount was killed in 1941 after commanding those units of the Royal Air Force who were once again to lend aid to the infantry of the B.E.F. engaged in 1940 in yet another campaign in the same country against the same foe.

THE INFANTRY BREAK THROUGH

The reports received from No. 3 Squadron, which had followed the attack of the XV Corps on Flers, were particularly encouraging; at half-past eight in the morning a tank was seen moving down the main street of the village, surrounded by the khaki-clad figures of the infantry. Though a great measure of success had befallen the left and centre of the attack, prospects on the right were not so bright. The XIV Corps, with sixteen tanks to help it, was assaulting a strong position east of Ginchy, known as the Quadrilateral. By 8 o'clock, No. 9 Squadron reported that the 6th Division was held up by this formidable strong point, though on the left the Guards Division had swept through Ginchy and had reached a line only 200 yards short of their third and last objective. On the whole, victory crowned our arms that day, for we had broken through two of the enemy's main defence systems on a front of six miles.

Throughout, the information supplied by continuous contact patrol for somewhat more than eight hours, was full and accurate. The R.F.C. was also able to pass on demands for ammunition, and requests for gun-fire on special targets. Its artillery observers, using the area or zone call already described, were particularly successful. On the front of the Reserve Army, three out of four formations of enemy troops massing for counter-attacks were detected and wiped out by artillery fire. In front of the Fourth Army, the position of 159 enemy batteries was spotted, and of these seventy were engaged with the help of air observation. Twenty-nine were silenced, thirteen by direct hits.

Whenever possible, the pilots of the R.F.C. took part in the actual fighting. Thus, Lieutenant A. L. Gordon-Kidd of No. 70 Squadron shot up eight field-guns outlined against a dusty road east of Courcellette. Two balloons were destroyed by No. 60 Squadron, but in this the hopes of the R.F.C. exceeded its achievement. The German balloons were not only very heavily defended, they were also hauled down as soon as the attacking aircraft were sighted. Two pilots of No. 60 Squadron, Ball and 2nd Lieutenant A. M. Walters, were among those sent to destroy balloons with Le Prieur rockets, mounted on the outside struts and fired electrically. Finding that their quarries had gone to ground they joined in an air battle and sought to use their rockets against a Roland and an L.V.G. Ball missed, but got his man with Lewis gun fire, while Walters had the satisfaction of hitting the L.V.G. with one of his rockets and sending it to the earth in flames.

Our own balloons were very active; one of them of No. 3 Section was moved in the afternoon to the outskirts of Montauban, where it was soon found that the cable attaching it to earth was in the direct line of fire of one of our heavy batteries. Nevertheless, the

observer preferred to accept the risk and continued his observations, until what was feared happened. A shell cut the cable, the balloon soared away and, having ripped it, the observer regained contact with the ground by parachute.

A heavy day's bombing programme was carried out, the targets including the Headquarters of General von Bülow at Bourlon. A pilot of No. 27 Squadron scored a direct hit on them, and another on the Château at Havrincourt. The best achievement of the day, however, was the attack made on German trains moving up with reinforcements. These had been observed by No. 70 Squadron, and early in the afternoon eight Martinsydes of No. 27 Squadron were sent out to do them all possible mischief. Three found a train near Gouzeaucourt. The bombs of the first hit the engine, of the second the rear truck, and of the third an ammunition wagon in the middle of the train. The other five hit trains at Ribecourt, Epehy, and a dump near Bantouzelle.

The fiercest air fighting took place about six in the morning over Havrincourt Wood, where Captain G. L. Cruikshank, leading seven Sopwiths of No. 70 Squadron, encountered the famous Boelcke. A Sopwith was lost and two others reached the Allied lines with dying observers on board. Against this, three Germans were driven down, and two more collided in the air, one of them crashing. That day our casualties were not light—six aircraft and nine officers missing, four officers and a sergeant-gunner wounded, three of them mortally. Against these must be set the loss to the Germans of fourteen aircraft seen to crash. Towards evening the general effect of this heavy fighting became apparent. While the R.F.C. continued to send out offensive and bombing patrols as strong and as numerous as those which had taken the air that morning, the German effort was spent. Very few of their aircraft were encountered.

It was after another day of confused and intense fighting that, on Sunday the 17th September, the Germans launched their air counter-attack. New special pursuit squadrons (*Jagdstaffeln*), led by the brilliant and intrepid Boelcke, came into action. With him was another famous German pilot, Manfred Freiherr von Richthofen, then at the beginning of his career. On the morning of the 17th, Boelcke, leading von Richthofen and four other pilots, met eight B.E.s of No. 12 Squadron escorted by six F.E.2Bs of No. 11 on their way to attack the railway station at Marcoing. The Germans did not come up with them until the bombs had been dropped, but almost before these had hit the ground battle was joined. The victory went to Boelcke. Two B.E.s and four out of six of the escort were shot down by pilots who had only received their new aircraft the previous evening. It was a remarkable achievement and rightly enhanced his prestige. Two days

later he repeated his success by preventing No. 11 Squadron, escorted by fighters of No. 60, from completing a reconnaissance near Quéant.

Our next general attack was to take place on Monday the 25th. Photographs of new German defences were naturally of the highest importance, and on the 22nd, pilots of the IV Brigade spent 303 hours in the air obtaining them. They had to fight to do so, for the Germans were now more active; yet despite considerable opposition the task was completed. Two incidents deserve mention—the feat performed by Lieutenant B. Fitz H. Randall, an observer, who, when his pilot fell unconscious over his controls, succeeded in landing the aeroplane, an F.E.2B, in a shell-hole behind our lines, and the good fortune which attended the skill of 2nd Lieutenant H. J. Finer, who, though in an unconscious condition, nevertheless successfully landed his aeroplane.

As on the 15th, so on Monday the 25th September, considerable success was achieved by our infantry. Pilots on contact patrol were able to report that the advance of our troops 'was wonderfully carried out in perfect order'. By the middle of the afternoon, a kite balloon observer gave the news that the day's attack had been completely successful except at the south-east corner of Morval, which fell later on that evening. Once more the work of the pilots and observers on contact patrol, belonging both to the Corps and the Headquarters Squadrons, must be emphasized. They were, of a truth, the eyes of the Army Commanders, and provided indispensable information. The contribution to victory made by men like 2nd Lieutenant T. E. G. Scaife, who made his last flight that afternoon and met death above Lesbœufs, was very great. These pilots saw many strange things—the capture of Gird Trench by the Leicesters, for example, when its occupants sought, by waving white handkerchiefs, to surrender to 2nd Lieutenant L. G. Wood and Lieutenant H. J. L. Cappel of No. 3 Squadron, who were raking them with machine-gun fire from the height of a few feet, and the surrender, near Thiepval, of a large number of the enemy to one Canadian. 'All the Germans got out of the trench,' said Captain Ian Henderson of No. 19 Squadron, 'and followed him back to our lines, running as hard as they could.' These and similar occurrences, seen and reported by the men of the R.F.C., showed that in this bitter struggle the foe was at last beginning to receive more than he gave.

In the air, however, the position was still serious. On the 27th September, for example, six Martinsydes of No. 27 Squadron were attacked by five German biplanes led by Boelcke; he killed 2nd Lieutenant S. Dendrino, whose aircraft, its pilot dead at the controls, continued to fly round and round in circles, and prevented the squadron from fulfilling its mission. Realizing that

the German Air Service was beginning to revive an offensive spirit, Trenchard made through Haig a demand for an immediate increase in the fighting squadrons attached to each Army from four to six, and eventually to eight. In his covering letter the British Commander-in-Chief emphasized the successes of the enemy and stated bluntly that 'it is necessary to realize clearly and at once that we shall undoubtedly lose our superiority in the air if I am not provided at an early date with improved means of retaining it'. The immediate result of this letter was to cause reinforcements, consisting of a Royal Naval Air Service Squadron under Commander G. R. Bromet, to be sent to the help of the R.F.C. It arrived at the end of October, flying a flight of Nieuports, another of Sopwith two-seaters, and another of Sopwith single-seaters, the famous 'Pups'.

Meanwhile, throughout October the fighting continued with heavy losses to both sides, and casualties among the R.F.C. began steadily to mount. In the middle of the month the weather broke; rainy days, by restricting flying, had an adverse effect on operations, for it was not possible to continue the production of full and accurate reports and the supporting bombardment inevitably suffered. Moreover, not only rain but a strong westerly wind seriously impeded the work of the R.F.C. On two days, the 10th and 16th October, the weather was fine and its pilots were out all day long, frequently encountering the enemy, whose victories were all scored by Boelcke's squadron. It remained the core of the German air defence, which by now had been reorganized and increased, so that on the 15th October its total strength in aircraft, with the German First Army between Hannescamps and Péronne, was 333. They showed considerable offensive spirit, notably on the 20th October, when a patrol of No. 11 Squadron was unable to carry out a photographic reconnaissance near Bapaume, all but two of the aircraft being shot down or forced to return damaged.

The conditions under which the R.F.C. were then fighting can be realized from what happened to an F.E.2B of No. 18 Squadron on the 22nd October, the last fine day of that month. It was escorting another aircraft on photographic reconnaissance and became involved in a fight with three Germans, one of which was shot down. The other two redoubled their attacks, evidently determined to avenge their comrade. They were firing from the rear, and Lieutenant F. S. Rankin, the observer of the F.E., stood up to return their fire with his Lewis gun over the top of the plane. He hit the engine of one of them and was immediately afterwards himself mortally wounded in the head and fell over the side of the cockpit. His pilot, 2nd Lieutenant F. L. Barnard, caught him by the coat as he fell and somehow managed to drag him back into the aeroplane, leaving his controls in order

THE DEATH OF OSWALD BOELCKE

to do so. These, on his return to the pilot's seat, he found for the most part shot away. Nevertheless, he succeeded in reaching our lines, where he landed just behind the forward trenches.

On the 26th October Boelcke was once more in action, and scored a victory with eight fighters against a number of our artillery observation aircraft in the Ancre area. Three of them were shot down, together with a Nieuport fighter. This was his last triumph. Two days later, in a fight with two De Havillands of No. 24 Squadron, he collided with one of his own side, his machine broke up in the air, and he was killed. Oswald Boelcke had shot down twenty R.F.C. machines in a little less than two months. A day or two later, the Royal Flying Corps dropped a laurel wreath to commemorate the passing of a gallant and chivalrous foe. By his courage, he had put fresh heart into a service which, a generation later, was for ever to defile its name by machine-gunning helpless civilians fleeing from a mightier and even more treacherous German onslaught than that in which he had taken part.

In addition to the Naval Squadron, three R.F.C. squadrons from England and three Corps squadrons from brigades farther north in the Ypres area, together with two fighting squadrons, had been brought by Trenchard to reinforce their hard-pressed, hard-fighting comrades on the Somme. It should not be forgotten, however, that they were flying machines inferior to the best of those of the enemy, a fact which their Commanding Officer recognized, for, despite a shortage of aircraft and pilots, he withdrew two squadrons flying B.E.12s, since their machines were 'too clumsy, and incapable of useful work against the hostile fighters'. The strain of the heavy fighting was beginning to make itself felt, and the pilots who remained also found that the rain, mist, and sleet, bad enough in October, were much worse in November. They strove manfully throughout that month, continuing their work of registering guns, reconnoitring trenches and strong points, attacking suitable targets with bombs and machine-gun fire, and then, more often than not, returning to base in the teeth of a westerly gale. It was at this time that Captain Lord Lucas, 'the oldest in years but youngest in heart of all the pilots of his squadron', was killed. Already in the South African War he had given a limb in his country's service; now, on the 3rd November, he gave his life.

The last heavy attack on the Somme was delivered on 18th November, when the outskirts of Grandcourt were reached. After that, rain came down in good earnest, followed by snow. The battle-field was transformed into a sea of mud, from which it did not emerge until the following summer. Since the beginning of October Haig's plans had had to be constantly changed to conform

THE VALUE OF AIR OFFENSIVE

with the steadily deteriorating weather. Had a St. Martin's summer been vouchsafed to us, greater gains would certainly have been made, and it is just possible that a decision might have been reached. As it was, the battle of the Somme can, at best, be claimed as no more than a Pyrrhic victory, to secure which, 343,000 men, the flower of the nation, had been lost. This was the heavy price we paid for relieving the German pressure on the French at Verdun and compelling large forces of the enemy to remain on the defensive.

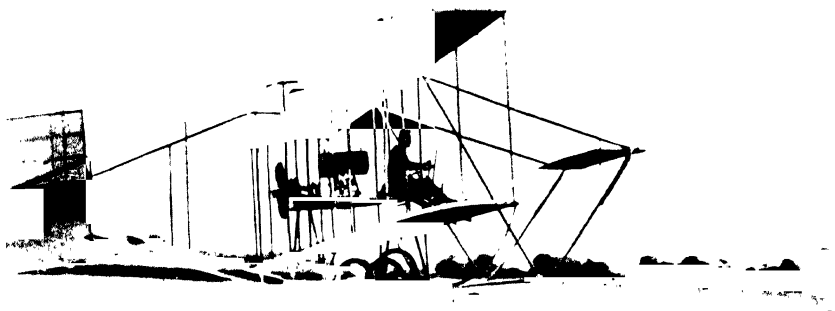
Though upon the ground victory had eluded us, the gleam of her wings was seen often enough in the air where, from first to last, even when they possessed an almost equal number of machines, the German Air Force was compelled to remain on the defensive and to engage in combat only over its own lines. This was a point of the first importance and was emphasized by General von Bülow commanding the German First Army during the battle. In a memorandum written shortly afterwards he laid stress on the helplessness of his infantry under artillery bombardment directed from the air and the inability of his own guns to reply, lacking as they did such an indispensable aid. As late as the 4th November, the German High Command was forced to issue an order pointing out yet once more the help and protection afforded to the German infantry and guns by airmen who fought their battles high up over the trenches of the Allies in front of their comrades below. This help and comfort from the air to troops on land has steadily increased in importance until it has now become a major factor in the conduct of war. No modern army can go forth to battle without an air force.

It was especially in the assistance which the R.F.C. gave to our artillery that the new arm made its weight felt. Between the 23rd June and the 20th October 1916, aeroplanes of the R.F.C. working with the Fourth Army observed artillery shoots on 1,721 occasions. Of these, 307 resulted in the destruction of the target, in each case an enemy battery, and 521 in damage, more or less heavy. In addition, 281 bombardments of the enemy's trenches were carried out with air observation. These figures are significant. The effect of air power was confirmed by General Ludendorff. 'The enemy's powerful artillery', he says in his memoirs, 'assisted by excellent aeroplane observation . . . kept down our own fire and destroyed our artillery.' The apologies of the defeated are not always the best of evidence, but, in this case, more reliable sources confirm the estimate of the vanquished general. Among others, Sir Henry Rawlinson, whose part in the battle had been considerable, ever afterwards expressed his conviction that the importance of aeroplane and artillery co-operation was 'enormous'.

HARDENED AND SKILLED IN BATTLE

When the battle died away, the R.F.C., though hard pressed in its later stages, still retained air superiority. It did not, however, rest upon its laurels. That, as Trenchard knew, would be fatal, and as early as the 22nd September, nearly two months before the battle ended, he urged, in a memorandum submitted to the General Staff, that the only sound policy was to exploit the moral effect of the aeroplane. This, he maintained, could only be achieved 'by attacking and continuing to attack'. Should the Germans seek to pass to the offensive, our counter-stroke must be to increase our own. On the 16th November, in pursuance of this principle, he once again asked, through the Commander-in-Chief, for an addition of twenty fighting squadrons, which would increase the proportion of fighters until they outnumbered the artillery observation machines by two to one.

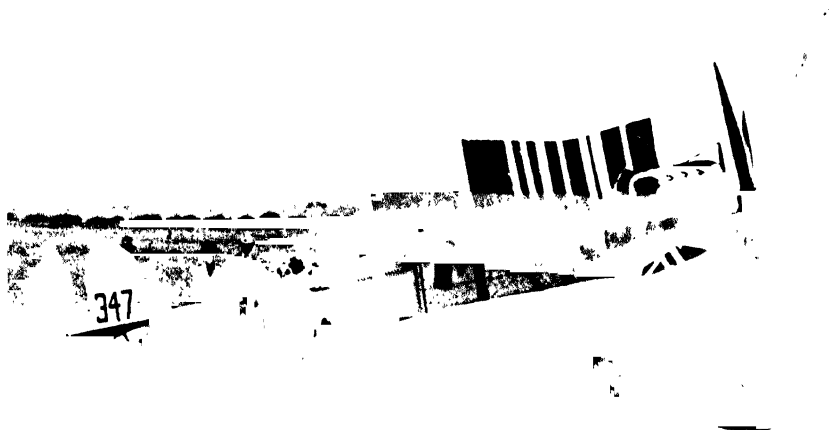
By the beginning of 1916 the Royal Flying Corps had done more than prove itself and win its spurs. It had become an integral, a vital part of the war machine, and it had learnt much—how to observe, how to bomb, how to fight. Full knowledge of these three facets of aerial warfare it could not claim, nor has such a claim ever been made either by the Royal Flying Corps or its successor, the Royal Air Force. In providing means for his own destruction, the ingenuity of man has not yet reached a limit. But by November 1916, a force of skilled men, hardened by fierce and constant combat, was patrolling the air from Calais to the left flank of the French Army, well to the east of the Somme. Their methods of observation had revolutionized the art of gunnery; and their bombing, though primitive by the standards of the early 1940s, had had at least the merit of being directed wholly against military targets, upon 298 of which they had cast 17,600 bombs weighing 292 tons. They had begun to bomb by night, though in this field the greatest success, the destruction of an ammunition dump at Audruicq on the 21st July, was to the credit of the enemy. They had made great strides in the development of air fighting, even if towards the end of the battle they had had to fly machines clearly inferior, both in speed and climb, to the best of the enemy. Nevertheless they had never lost their offensive spirit. Above all, they had displayed the finest quality of their race—endurance, lit on occasion by the bright flame of genius. The art of flying has made great progress since those early days, but the courage and skill of the pilots who, in 1940, fought and won the Battle of Britain, were first displayed in 1916 by men unequipped with parachutes, flying machines of wood and linen with far from reliable engines and a top speed of well below 100 miles an hour. They observed and bombed and fought above a grim and grisly battle-field to land on which only too often meant death or severe injury: 426 pilots had been available for

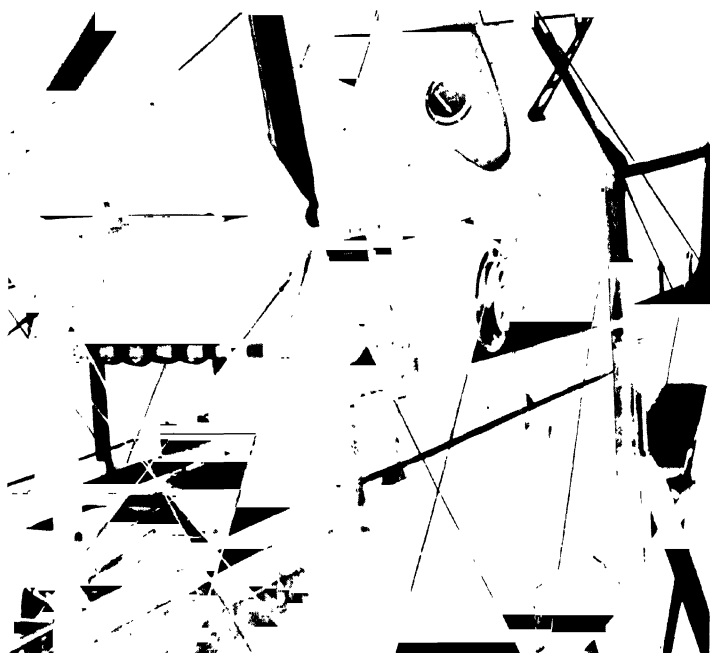


‘Audacious men, they clothed their vibrant vision with wood and linen’ . . .

NAWAB SALAR JUNG BAHADUR

The first R.F.C. aircraft to land in France, on August 13th, 1914: a B.E.2B



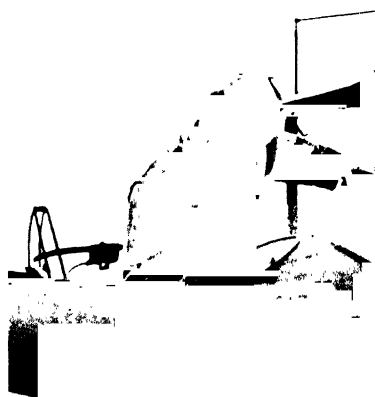


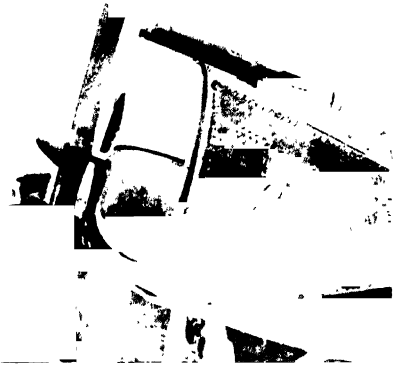
Cockpit of Armstrong-Whitworth F.K.8, showing pilot's seat, petrol tank and instrument board

WEAPONS AND EQUIPMENT, 1914-18

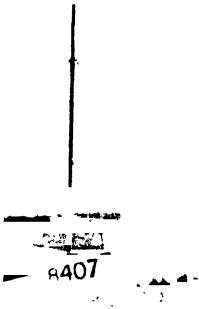
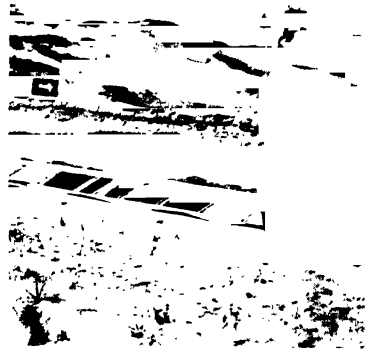
(Left) One of the first cameras for air photography, fitted on a B.E. biplane

(Right) A primitive bombsight and release: the pilot was directed by hand

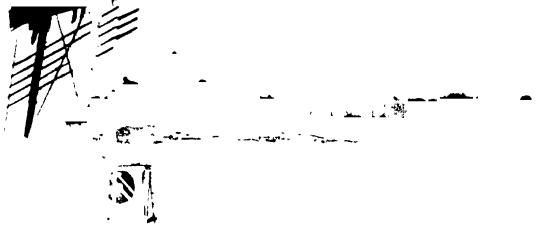




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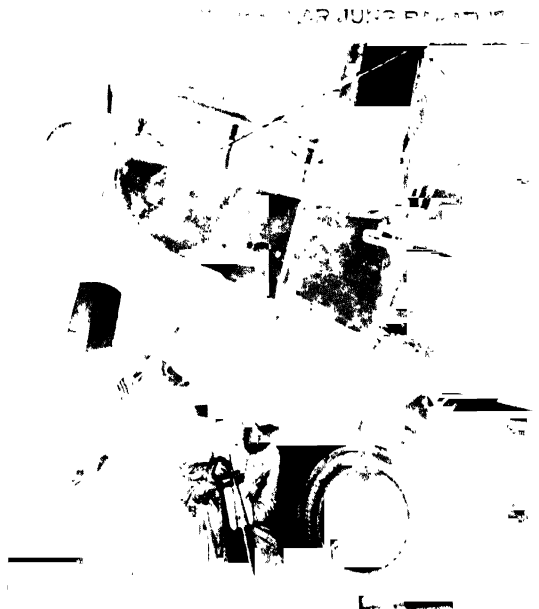


The first machine-gun mounted to fire through the airscrew

Target practice from a cockpit running on rails, 1918

Le Prieur rockets were used to attack kite balloons and airships

Bombing up with incendiaries, No. 69 (Australian) Squadron



1. Balloon used in the Bechuanaland exped
2. Kite-balloon goes up spot for artillery
3. Gondola of a patrol naval airship
4. Handley Page bomber over Dunkirk beach
5. Sopwith Camel biplane looping
6. R.E.8 reconnaissance aircraft in flight



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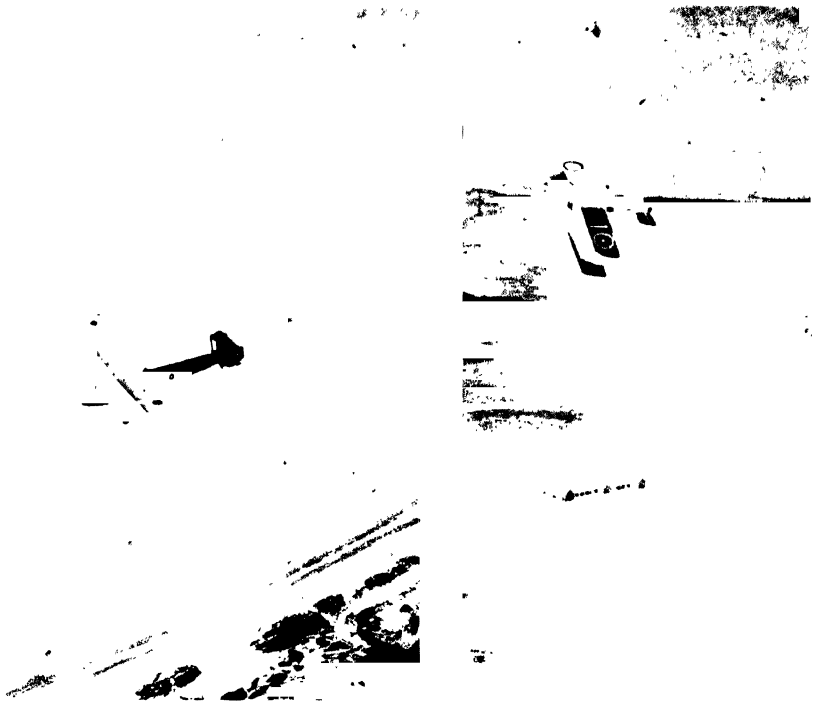
THE TASKS: RECONNAISSANCE, FIGHTING, BOMBING

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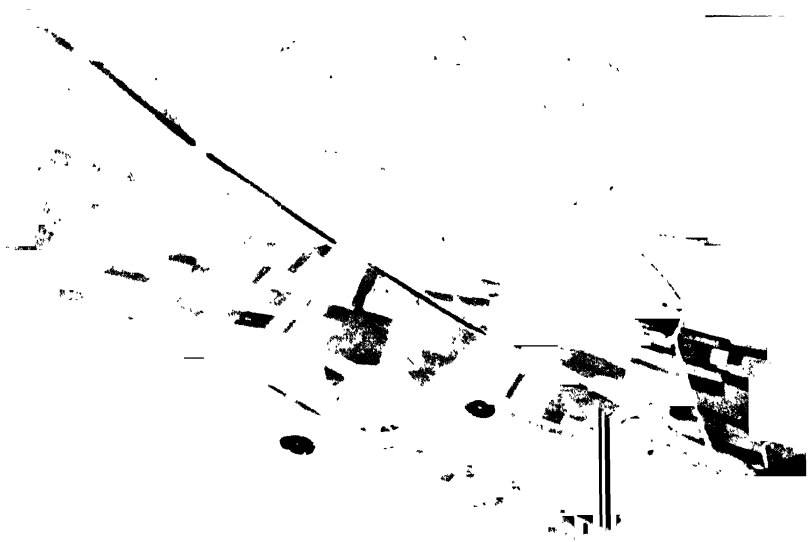


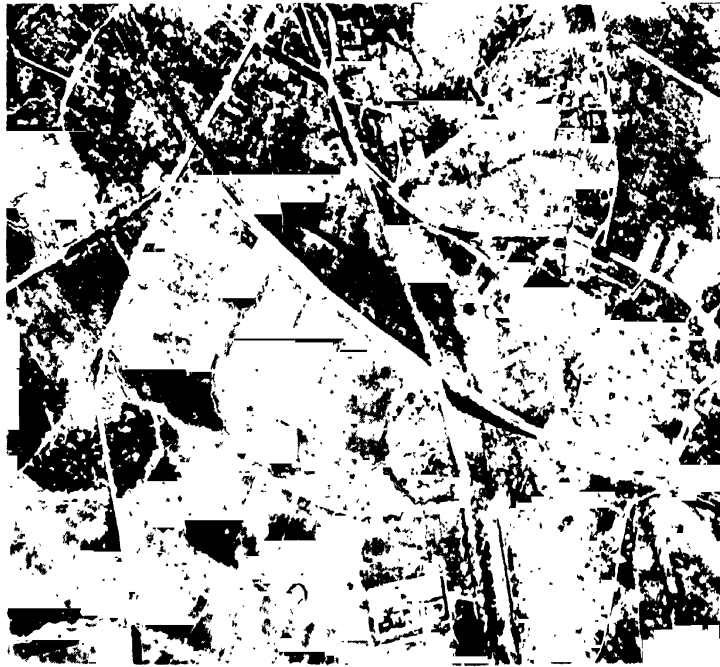
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IN WAR SALAR JUNG BAHADUR

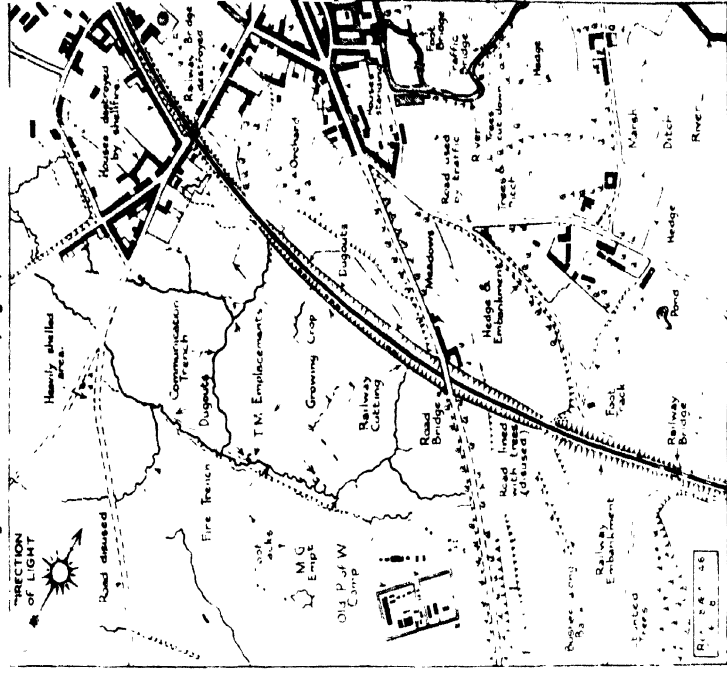




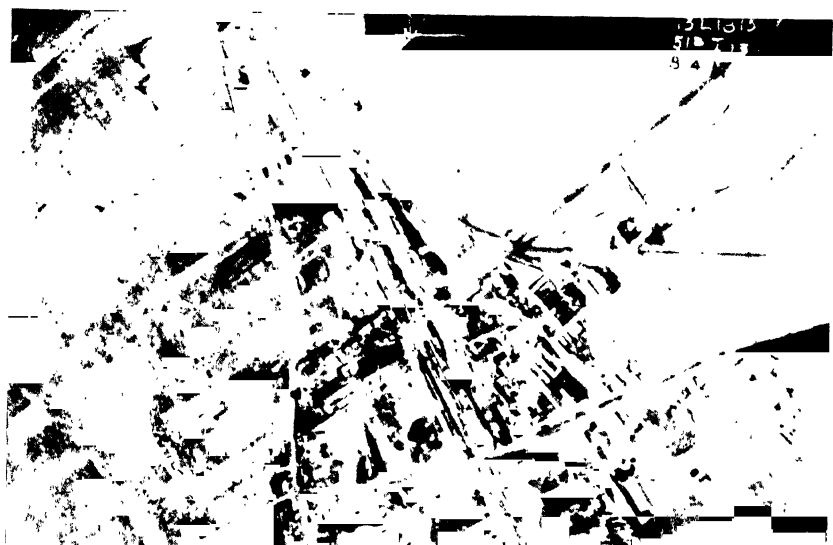
An air photograph of S. Albert, taken in 1918, with the interpretation sketch that was made from it, showing German trenches and gun-emplacements

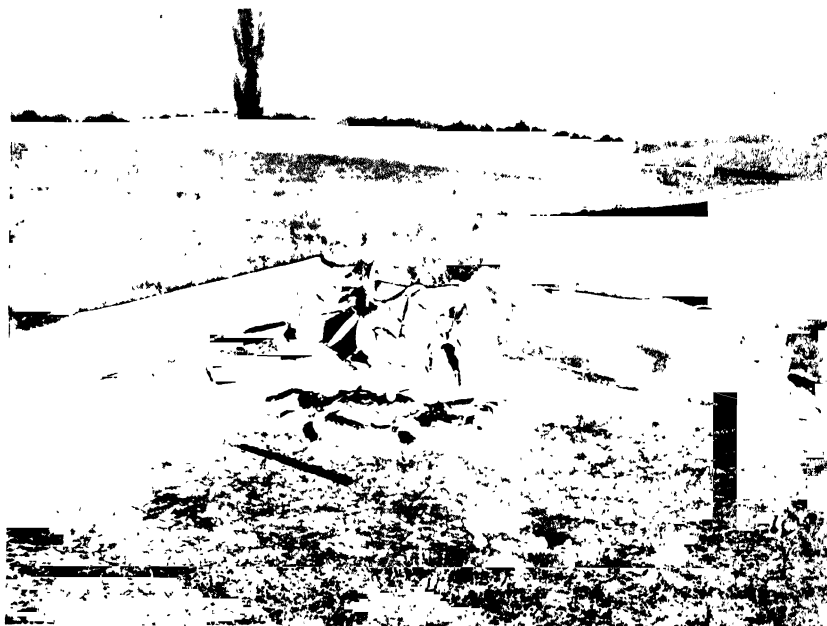
INTERPRETATION SKETCH

illustrating natural & topographical features, etc.



The chemical works at Roeux, photographed from the air in 1917, were subjected to bombardment by the British artillery and totally obliterated. An instance of air-ground co-operation





'In that Decorum Perfectly Instructed.' The air war of 1914-1918 was bitter and costly. Flying often unreliable machines, without parachutes, the pilots fought it out to the death. (*Above*) A British airman lies dead beside his Nieuport scout at Soissons. (*Below*) A wrecked German D.F.W. biplane at Pilckern



A PROUD AND SORROWFUL RECORD

duty on the 1st July 1916; 585 were with their squadrons on the 17th November. Between those dates 308 had been killed, wounded, or were missing, and 268 had been struck off the strength from causes other than direct enemy action. The figures of casualties among the observers for the same period are 191. The squadrons had, on the 1st July, numbered 27; on the 17th November they numbered 35. In that period of nearly five months, in addition to the bombs dropped, their pilots took 19,000 photographs, registered 8,612 targets for the guns, destroyed 164 German aircraft and damaged 205. This is a record of which any force might at any time be proud, and the Royal Flying Corps was not yet five years old. A sterner test, heavier fighting, new tactics, new perils, and final triumph lay ahead.

9. Air Power Goes to Sea

WHILE the Royal Flying Corps was becoming ever more deeply engaged in the task of co-operating with our armies in the field, the Royal Naval Air Service was providing air support for the Navy. Its part was, in some respects, the more difficult of the two, for its field was the field of ocean, the foam-flecked rollers of the North Sea, the blue and flashing waves of the Mediterranean, the long swell of the Indian Ocean, the waters, in fact, of all the seven seas wherever the Royal Navy spread its 'sure shield' in the protection of Great Britain and her Empire. Over this vast expanse the Air Service had to fly in aircraft neither powerful nor reliable enough to ensure the performance at all times and in all conditions of its task. Only two years before the outbreak of the war had the first successful landing on water been made. Man's fertile invention, occupied with the development of ships for more than a thousand years, had concerned itself with the development of seaplanes and flying-boats for less than a thousand days. This must always be borne in mind when considering the part played by aircraft in the history of the war at sea between 1914 and 1918.

Two problems faced the Navy; it had to be ready at all times to meet the surface vessels of the enemy, ranging from a lone raider like the *Emden* to the whole of Admiral Scheer's powerful battle fleet, and it had to bring to nought a more insidious form of attack, that delivered beneath the surface by submarines. The second of these tasks was the more difficult, for it is alike the proud boast of the Royal Navy and a recorded fact of history that no enemy fleet has ever prevailed against it. Nor, in the end, were the U-boats, lurking in the depths, to have that good fortune. They came very near to it but they failed, and it is the share which the Royal Naval Air Service had in their discomfiture which must first be indicated.

The U-boat as a weapon of victory had been the constant study of the German High Command for some years, and the war was scarcely six months old when they gave a clear proof of their intention to make the greatest possible use of it. An Order of the German Admiralty, which came into force on the 18th February 1915, declared the waters washing the British Isles, including the Channel, to be a war zone in which neutrals would sail at their risk and peril and all Allied ships be destroyed. The German naval commanders lost but little time in putting this order into effect. The possession of Zeebrugge and Ostend, which fell to the German armies in October 1914, provided submarine bases

TO COUNTER THE U-BOAT

uncomfortably close to these shores and, for a long time, rendered the Channel very insecure. Before 1914 was out three ships had been attacked in it, and 1915 was only an hour or two old when the battleship *Formidable* was sunk off the coast of Devon. The British Admiralty at once took steps to make use of the new air arm to combat this swiftly growing menace. On the 21st November 1914 a seaplane base was established at Dover and another at Dunkirk, and from these a series of resolute but quite ineffective bombing attacks were made on the newly won German bases. Early in 1915 the Admiralty became aware that the shipbuilding facilities of Antwerp were being used to assemble a new type of submarine, some ninety feet long, specially designed for operating near our coasts. The great Belgian port was accordingly attacked on the 24th March and the 1st April, but only three aeroplanes, carrying in all twelve 20-lb. bombs, succeeded in reaching the target. It was clear that such assaults, however gallantly made, could not even scratch the surface of the problem, and it was equally clear that an effective patrol of home waters was essential if heavy shipping losses were to be avoided.

Fortunately, the country possessed at that time, in the person of Lord Fisher, a First Sea Lord endowed with the cunning of the fox, the hide and memory of the elephant, and the resolution of the lion. On the 28th February 1915 this fierce old man, whose fiery tongue was the joy and terror alike of his equals and his subordinates, ordered Wing Commander E. A. D. Masterman and Commander N. F. Osborne to produce immediately a number of small, fairly fast airships, whose task it would be to hunt German submarines. Within three weeks, the first of the S.S. or Submarine Scout Class airships was ready for service. A firm of raincoat manufacturers was called upon to make the envelopes; another, which produced furniture, built the bodies. Before these firms got into their stride, however, the fuselage of a B.E.2c had been slung beneath the elongated envelope of a Willows airship and the first patrol carried out. It was found that this form of craft could remain aloft for eight hours, attain a speed of from forty to fifty miles an hour, and carry wireless, and 160 lbs. weight of bombs.

Patrols were flown over the Straits of Dover and the approaches to the northern and southern ends of the Irish Sea, and by the end of July 1915 airship bases, at Folkestone and Polegate, had been established on one side of the Straits and at Marquise near Calais on the other side. A few weeks later, a fourth was opened at Anglesey off the coast of Wales. From these hastily erected homes, hastily erected airships began their monotonous and far from easy task. Their crews soon found that besides watchfulness and endurance they needed much of the angler's cunning, and

one of them was presently heard to describe submarine hunting as 'a serious sport in which the fish are not at all keen to rise to the fly'. The habits and habitats of these deadly fish required as close study, as did the signs, slight and insignificant, by which their presence might be detected. In the clear depths of the Mediterranean or the Baltic submarines could be seen when they were as far down as eighty feet beneath the surface; in the troubled waters round these coasts this was almost impossible, and their whereabouts had nearly always to be discovered by inference. Patches of oil, or thin streaks of it, were the most usual signs for which the watchers in the sky were upon the look-out; a periscope, unless the submarine was moving faster than two knots, was almost impossible to see. Occasionally, the behaviour of gulls betrayed the U-boat, but it was soon found that for some reason, familiarity perhaps, the birds ignored periscopes in the North Sea while following with dogged persistence any which moved through the waters of the Irish Channel.

The airships continued to persevere and, even if opportunities for attack were few and far between, they did cause the U-boat to avoid the surface and to travel submerged where her speed and radius of action were much reduced. Towards the end of 1915, a larger airship, the 'C' type, designed when at full speed to patrol at forty-five miles an hour for eleven hours, came into service. This improved craft gradually took the place of the Submarine Scout airship, and, before 1916 was out, twenty-seven had been built at Kingsnorth and delivered to the various airship stations, whose numbers had by then increased; there were now bases at Pembroke, at Pulham, at Howden in Yorkshire, at Peterhead, and at Mullion in Cornwall.

The work of airship patrol was not only full of monotony but also of hazard. On the 15th September 1916, for example, the S.S.42 reached her station after a patrol near Lundy Island, carried out in bad weather. As she was mooring, a gust of wind thrust the airship violently against the ground and tore away most of the port-side suspension ropes of the car, which turned upside down. The wireless operator fell out and, relieved of his weight and that of the trail rope which had broken off, the airship shot rapidly upwards, her pilot, Flight Lieutenant E. F. Monk, seated helpless upon the upturned bottom of the car. On reaching 7,000 feet the forward starboard suspension ropes gave way and the car then hung vertically, the pilot contriving at the last moment to scramble on to the under-carriage. His ordeal endured some three hours, and then the airship began to fall with ever-increasing speed till she hit the ground at Ivybridge in Devonshire. Flight Lieutenant Monk escaped with slight injuries. A week previously, a 'C' class airship had forced a U-boat to abandon

FLUCTUATIONS OF THE U-BOAT⁶ CAMPAIGN

her prey, consisting of two French sailing-vessels from which the German commander had already removed an odd collection of articles, among which figured coffee, condensed milk, tinned crab, carrots, a panama hat, and a number of old boots.

So considerable was the work of these airships that new types had soon to be designed and put into manufacture. One of them, the S.S. 'P' or 'Pusher' airship, could fly for seventeen hours at a speed of forty-three knots. By the time the first of these was undergoing preliminary trials in January 1917, fifty S.S. airships had been built and were operational. While the new craft were still on the drawing-board, an adventurous experiment was carried out, at the cost of their lives, by two gallant officers, Commander N. F. Osborne and Lieutenant-Commander de Courcy W. P. Ireland. By means of an airship envelope, which could be detached at the will of the pilot, they sought to raise into the air a complete B.E.2c aeroplane. The advantages of such a contraption, if it could be made to work, were obvious; the range of the aeroplane would be greatly increased. Unfortunately, when the final trial was carried out on the 21st February 1916, the envelope parted prematurely from the aeroplane, which threw out one of its occupants and crashed out of control with the other.

The campaign against the U-boat, in which both the lighter- and heavier-than-air craft of the R.N.A.S. were taking part, fluctuated considerably. The climax of the first phase, which had included the sinking of the *Lusitania* on the 7th May with the loss of 1,198 men, women, and children, was reached in August 1915. On the 19th of that month the White Star Liner *Arabic* was torpedoed, and the sinking of these two ships, both of which carried large numbers of Americans aboard, brought Germany and the U.S.A. to the edge of war. By then the German Admiralty was convinced that unrestricted submarine warfare would make victory certain, but the German Foreign Office had no intention at that time of bringing America into the fight, and the German Foreign Office prevailed. On the 27th August 1915 the Kaiser issued orders that no passenger steamers in the prohibited zone were to be sunk until all on board had been removed. The effect of this order was to cause the withdrawal of German submarines from our Home Waters to easier hunting-grounds in the Mediterranean and the Aegean Sea. The respite did not last for long, and the smaller type of German U-boat, operating off the Belgian coast, was always active. They were attacked whenever possible by the Dunkirk pilots of the R.N.A.S., who, however, could do no more than inflict damage on two of them.

All this while, the controversy between the German Admiralty and the German Foreign Office continued to rage. At the beginning the first had been vanquished by the second; but with the

THE CRITICAL DAYS OF 1917

resumption of unrestricted U-boat warfare in March 1916 Admiral Scheer scored a momentary triumph. On 24th April, however, the German Government once more yielded to American protests and called off the unrestricted campaign. The submarines thus released were dispatched for duty with the High Seas Fleet. But not for long. By September they had returned to their attacks on shipping near our coasts, and the position rapidly became serious. To cope with it a seaplane patrol organization was set up, based on Calshot, Portland, and Bembridge; despite its activities the losses in shipping went on mounting, and the German Government presently decided once for all to ignore any reactions which this method of warfare might provoke in the U.S.A. Victory seemed within their grasp; they snatched eagerly at it, and on the 1st February 1917 opened that final campaign of unrestricted U-boat warfare which was to prove so dangerous a menace. At that time the enemy had available 111 submarines, 49 based on North German ports, 33 at Zeebrugge and Ostend, 24 at Pola in the Adriatic, 2 at Constantinople, and 3 in the Baltic. About 40 were at sea at any one time. They were resolute and active and between the 1st and 7th February they had sunk 35 ships in the Channel and the Western Approaches. Before March was out it was known in Whitehall that at least eight submarines were operating between the western point of Ireland and the English Channel. Drastic measures had to be taken, and it was then that the convoy system, which was eventually to save the situation, began to be instituted. It was, however, immediately obvious that the R.N.A.S., now under a Director of Air Services, should increase its patrols by every possible means. Airships had played a part, and an important part, at the beginning, but they were no longer enough; seaplanes, flying-boats, and land-based aircraft must all be pressed into service if probable defeat was to be changed into certain victory.

The trouble with seaplanes at that time was that they were not really seaworthy and could not, therefore, be used except in conjunction with surface vessels in the hunt for submarines. What was needed was a craft which could find the U-boat and attack it without assistance from another arm or another element. As early as 1909 endeavours had been made, notably by Sopwith, to produce a flying-boat, and at the outbreak of war in 1914, his Sopwith 'Bat' was the only machine of this kind in England. The development of this type of craft was due very largely to the unremitting efforts of Commander S. C. Porte, who at one time had held a commission in the Royal Navy, to which service he returned as soon as war was declared. In September 1915 he found himself in command of the Naval Air Station at Felixstowe, where he at once set about building flying-boats on

THE SPIDER WEB PATROLS

the lines of the American 'Curtiss' craft, but embodying many improvements. The new boats were known as the Large Americas in contrast with the original boats which were called the Small Americas. Porte's ideas were large; so were his boats; they weighed from $4\frac{1}{2}$ to $6\frac{1}{2}$ tons and 'carried sufficient petrol for work far out from land, and big enough bombs to damage or destroy a submarine otherwise than by a direct hit'. Such powerful craft, however, took months to develop, and it was not until the spring of 1917, at the precise moment when they were most needed, that they were ready. During that crucial year they sighted no less than sixty-eight U-boats on patrol, attacking forty-four of them with bombs. By the end of it the man who had inspired and built them was in grievous ill-health. Tuberculosis had made its appearance and, though he lingered for two years more, death came to him when he was but thirty-six. 'The shortest possible list,' says Sir Walter Raleigh, 'of those who saved the country in its hour of need would have to include his name', and the history of the war which began in 1939 can only add to this tribute.

Porte's first aircraft, unofficially called H.M.S. *Baby*, was produced early in 1916. Though fitted with three 350-h.p. Rolls-Royce engines, which gave it a speed of 80 knots, it proved too slow and vulnerable, and soon gave place to the renowned 'F' type of flying-boat. When perfected in 1917, these were powered with two Rolls-Royce engines, giving a maximum speed of 85 knots; the crew numbered four; 460 lbs. of bombs and four Lewis guns were carried, and the boats could reach 13,000 feet fully loaded; at cruising speed they could fly for eight hours. It was with craft such as these that the Spider Web patrols began to be flown in the spring of 1917. The centre of the web was the North Hinder Light Vessel, from which eight radial arms, each thirty miles long, were, in imagination, projected. These were joined by cords, respectively ten, twenty, and thirty miles from the centre. This system, which enabled some 4,000 square miles of sea to be searched, was adopted by aircraft based on Felixstowe. Patrols similar in character were flown from Plymouth, Newlyn, the Scilly Isles, and Fishguard. All reports of the presence of U-boats in the North Sea web, whether received from observers in the air or from Admiralty intelligence, were concentrated at Felixstowe, where they were plotted on a chart. Thus it could be determined immediately in what part of the web the water-fly would most likely be caught. The maintenance of these charts was the beginning of those complicated Operations Rooms of Coastal Command, which, more than twenty years later, were to send bigger and better flying-boats on wider and longer missions against the same insidious prey.

The first success by Porte's boats was scored on the 20th May

THE CRITICAL DAYS OF 1917

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THE SPIDER WEB PATROLS

lines of the American 'Curtiss' craft, but embodying many improvements. The new boats were known as the Large Americas contrast with the original boats which were called the Small Americas. Porte's ideas were large; so were his boats; they weighed from $4\frac{1}{2}$ to $6\frac{1}{2}$ tons and 'carried sufficient petrol for work out from land, and big enough bombs to damage or destroy submarine otherwise than by a direct hit'. Such powerful craft, however, took months to develop, and it was not until the spring 1917, at the precise moment when they were most needed, that they were ready. During that crucial year they sighted no less than sixty-eight U-boats on patrol, attacking forty-four of them with bombs. By the end of it the man who had inspired and built them was in grievous ill-health. Tuberculosis had made its appearance and, though he lingered for two years more, death came to him when he was but thirty-six. 'The shortest possible epitaph,' says Sir Walter Raleigh, 'of those who saved the country in the hour of need would have to include his name', and the history of the war which began in 1939 can only add to this tribute. Porte's first aircraft, unofficially called H.M.S. *Baby*, was introduced early in 1916. Though fitted with three 350-h.p. Rolls-Royce engines, which gave it a speed of 80 knots, it proved too slow and vulnerable, and soon gave place to the renowned 'F' type of flying-boat. When perfected in 1917, these were powered with two Rolls-Royce engines, giving a maximum speed of 85 knots; the crew numbered four; 460 lbs. of bombs and four Lewis guns were carried, and the boats could reach 13,000 feet fully loaded; at cruising speed they could fly for eight hours. It was this craft such as these that the Spider Web patrols began to be flown in the spring of 1917. The centre of the web was the Northlander Light Vessel, from which eight radial arms, each thirty miles long, were, in imagination, projected. These were joined by cords, respectively ten, twenty, and thirty miles from the centre. This system, which enabled some 4,000 square miles of sea to be searched, was adopted by aircraft based on Felixstowe. Patrols similar in character were flown from Plymouth, Newlyn, the Lizard, the Lundy Isles, and Fishguard. All reports of the presence of U-boats in the North Sea web, whether received from observers in the air or from Admiralty intelligence, were concentrated at Felixstowe, where they were plotted on a chart. Thus it could be determined immediately in what part of the web the water-fly could most likely be caught. The maintenance of these charts was the beginning of those complicated Operations Rooms of Coastal Command, which, more than twenty years later, were to find bigger and better flying-boats on wider and longer missions against the same insidious prey.

The first success by Porte's boats was scored on the 20th May

THE CRITICAL DAYS OF 1917

resumption of unrestricted U-boat warfare in March 1916 Admiral Scheer scored a momentary triumph. On 24th April, however, the German Government once more yielded to American protests and called off the unrestricted campaign. The submarines thus released were dispatched for duty with the High Seas Fleet. But not for long. By September they had returned to their attacks on shipping near our coasts, and the position rapidly became serious. To cope with it a seaplane patrol organization was set up, based on Calshot, Portland, and Bembridge; despite its activities the losses in shipping went on mounting, and the German Government presently decided once for all to ignore any reactions which this method of warfare might provoke in the U.S.A. Victory seemed within their grasp; they snatched eagerly at it, and on the 1st February 1917 opened that final campaign of unrestricted U-boat warfare which was to prove so dangerous a menace. At that time the enemy had available 111 submarines, 49 based on North German ports, 33 at Zeebrugge and Ostend, 24 at Pola in the Adriatic, 2 at Constantinople, and 3 in the Baltic. About 40 were at sea at any one time. They were resolute and active and between the 1st and 7th February they had sunk 35 ships in the Channel and the Western Approaches. Before March was out it was known in Whitehall that at least eight submarines were operating between the western point of Ireland and the English Channel. Drastic measures had to be taken, and it was then that the convoy system, which was eventually to save the situation, began to be instituted. It was, however, immediately obvious that the R.N.A.S., now under a Director of Air Services, should increase its patrols by every possible means. Airships had played a part, and an important part, at the beginning, but they were no longer enough; seaplanes, flying-boats, and land-based aircraft must all be pressed into service if probable defeat was to be changed into certain victory.

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THE SPIDER WEB PATROLS

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SUCCESSSES OF OUR FLYING-BOATS

1917, when the craft commanded by Flight Sub-Lieutenant C. R. Morrish bombed a U-boat on the surface of the North Sea. She was the U.C.36, and must find a modest place in history as the first submarine to be sunk from the air. Further successes were scored in the next two months, two U-boats being sunk in July. Despite two enemy bombing attacks on the base at Felixstowe and occasional combats the run of luck continued. In one flight a flying-boat, of which the pilots were Flight Commander N. Sholto Douglas and Flight Lieutenant B. D. Hobbs, was shot down after half an hour's action with an aeroplane and two seaplanes. As soon as the Germans had made off, the crew of the flying-boat set to work and repaired the centre and port engines till they could be induced to turn slowly. The boat was then taxied for nine hours till she reached safety near Orfordness.

The most spectacular successes of the flying-boats were secured against Zeppelins, of which they destroyed two. On the 14th May 1917 a Large America, captained by Flight Lieutenant C. J. Galpin, set out to find a Zeppelin reported near the Terschelling Light Vessel. The crew of the America sighted her soon after dawn, 2,000 feet below. They dived; fire was opened at a range of fifty feet and a moment later a roaring, glowing mass plunged downwards into the sea. She was the L.22, and next month the L.43 met a similar fate from a similar type of craft off Vlieland. After these disasters the Zeppelins abandoned low for high patrols, where the flying-boats could not reach them.

By the middle of July 1917 the convoy system was in full swing, and as the long, slow lines of merchant ships, freighted with the food and munitions without which Britain was doomed, approached her shores, they were met by the airships which provided air escort until harbour was reached. The base at Mullion in Cornwall was the most active. While airships, because of their very slow speed, had little chance of destroying U-boats, they were none the less a menace to them, for they could signal their presence to destroyers and other patrolling craft. It says much for the efficiency of this type of aircraft that, throughout 1917 when the U-boat campaign was raging with the fiercest intensity, no ship escorted by them was attacked. In that year, the airships based on Mullion flew a total of 2,845 hours. One of them, the C.9, commissioned in July 1916, had covered over 70,000 miles before the end of the war, and had had many adventures, of which the most remarkable occurred on the 3rd October 1917. On that day, a rising gale forced all the airships on patrol, the C.9 among them, to return to Mullion. On the way home, her captain, Flight Commander Struthers, looking astern, saw an Italian ship about six miles away burst into flames. He at once turned his airship which, speeding down the gale, reached the

AIR WAR IN THE CHANNEL

stricken vessel in a matter of minutes. She had fallen a victim to a U-boat, and her attacker was lying just below the surface. The C.9 dropped all her bombs and at the same time summoned surface patrol vessels, which attacked with depth charges. Being unable to do more, the C.9 then turned for home and at once had to face a gale rising at times to sixty miles an hour, which held her sometimes stationary and sometimes even drove her slightly backwards. She took six hours to cover the forty miles back to base.

In addition to seaplanes, flying-boats, and land-based aircraft, kite balloons with observers in their baskets were flown from destroyers. Admiral Beatty formed a Kite Balloon Force of six destroyers, which did useful work along the known U-boat tracks. On 12th July 1917, during an organized hunt in the North Sea, the observer in a balloon flown from H.M.S. *Patriot* spotted the U.69, which was duly sunk by depth charges. The balloon-carrying vessels and flying-boats also formed a part of the North Sea barrage, a minefield laid with the object of preventing U-boats from using the north-about route to the Atlantic between Scotland and Norway.

Vessels sailing along the French coast had also to be protected from submarines, and in this the co-operation of the French was immediately forthcoming. On the 21st July 1917 an R.N.A.S. station was established at Cherbourg and began to operate with success, one of these seaplanes, a Wight, sinking the U.B.32, on the 18th August, with a 100-lb. bomb laid with precision just ahead of the periscope. The other British bases at Dunkirk and Dover had by then been in operation for some considerable time. They did not hunt their prey unmolested, for they were under constant attack from German aircraft operating from Zeebrugge. In March 1917 the enemy established a second base at Ostend, and soon afterwards was able, for a time at least, to claim local air superiority. In May, no less than six French flying-boats were shot down, and the base at Dunkirk was so reduced that only five fighters, three of which were under repair, could be mustered. They were reinforced by nine Baby Sopwith seaplanes, and the anti-submarine patrols were resumed.

It was the practice of the aircraft to fly with carrier-pigeons on board in order to supplement their wireless. At 7 a.m. on the morning of the 19th June 1917, in the midst of a raging thunderstorm, two pigeons arrived at Dunkirk. The messages they carried were short and to the point. The first read: 'Short shot down. Potvin? 10 N.N.E. Nieuport. 1 Hun shot down. My tanks shot. French T.B.D. on its way. Send fighters.' The second read: 'Short landed. O.K. 10 N.N.E. Nieuport. Potvin? I shot one down but he did not crash. My tanks no good, cannot climb.

A BITTER ENCOUNTER

French T.B.D. on its way. Send some fighters quick.' As these messages were being read, another bird arrived with information still more laconic. 'Am shot down, hit in tank, radiator. Rogers dead. Please send C.M.B.¹ at once.' This is what had happened. A Short seaplane, of which the observer was Sub-Lieutenant T. Rogers, was on anti-submarine patrol escorted by two Sopwith Baby seaplanes, one of which was piloted by Flight Sub-Lieutenant J. E. Potvin. A battle had been fought between the three British and an equal number of German seaplanes; during its course Potvin was shot down, but his adversary suffered a similar fate. Rogers, the observer in the Short seaplane, had been killed almost immediately afterwards, and the seaplane forced down with a damaged engine. The only one of the duellists, for such they may be called, to escape unscathed was Flight Lieutenant Graham flying a Sopwith, and it was he who attempted to obtain help from a French destroyer for the crew of both the British and German seaplanes rocking on the water with their dead and wounded. Eventually, two coastal motor-boats were sent out from Dunkirk. Neither of them found the seaplanes. One broke down and was captured and the other returned after an unsuccessful attack on four German destroyers.

This action, which cost us two seaplanes and a coastal motor-boat at that time on the secret list, showed the necessity of providing effective antidotes to the vigorous, well-handled German aircraft. In place of the Sopwith seaplanes, our Dunkirk base was presently provided with Sopwith 'Pups', and in September 1917 these gave place to Sopwith 'Camels'. During the intermediate stage, while the change-over was being effected, a 'Large America' flying-boat operated for some time from July 1917, and on the 22nd September bombed and sank the U.C.72, after scoring two direct hits on her hull. She was on diving trials and had a number of German nurses on board, for whom this was the first and last voyage in a submarine. Eventually, on the 1st February 1918, the whole station was taken over by the Americans; a new Naval Squadron flying land planes was established at Berques, and continued anti-submarine patrols over the Straits and the coastal waters of Belgium till the end of the war.

From the foregoing account of the air side of anti-submarine warfare, it will be seen that the main usefulness of the Royal Naval Air Service was in the help it could give to merchant shipping and their escorts in the waters near our coasts. The constant coast-wise patrols carried out by three kinds of aircraft, land planes, seaplanes, and airships, not in all weathers—for in those days that was not possible—but whenever the weather permitted, contributed not a little to the mastering of the U-boat. As the

¹ Coastal motor-boat.

KEEPING THE U-BOATS DOWN

war progressed the commanders of these craft tended to pay ever closer heed to the menace of the air. On occasions, as on the 28th September 1917, when a U-boat and a flying-boat engaged in a duel with guns and bombs, they kept their submarine on the surface and tried to fight it out. Far more often, however, they preferred to lurk in the deeps of the sea, secure from bombs and reasonably secure from observation. As has already been said, these tactics had one great disadvantage from the German Admiralty's point of view. The submarines, sent out to do the maximum amount of destruction in the minimum amount of time, were frequently unable, when near our coast, to move on the surface except at night, and could not, therefore, carry out more than a limited programme of hunting during the period of their patrols. Each time they were forced to dive and to remain submerged, both the period during which they could remain at sea and the distance which they could cover were inevitably reduced. Thus, at a time of acute crisis, the Royal Naval Air Service, the ancestor of Coastal Command of the Royal Air Force, rendered not only valuable, but, indeed, indispensable aid to the Royal Navy. An attempted estimate of how much our victory over the U-boat in the Four Years War was due to operations in the air is neither possible nor desirable. It is enough to record that both Services worked together with a will to achieve a common object, and that that object was, in fact, most fully achieved.

The other major problem facing the Navy was the need to prevent the German High Seas Fleet from playing any part in the war. This could be brought about either swiftly by battle or slowly by blockade, but the choice of method lay not with ourselves but with the enemy. It was open to Admiral Scheer to put to sea and fight, or to remain in port, thus keeping our Grand Fleet ever on the watch against his coming out, and not therefore available for operations elsewhere. In the event, he took first one course, then the other, until, after the sortie of August 1916, he decided to remain in harbour. After more than two years of such idleness his seamen mutinied and his proud ships, scuttled by their crews, sank ignobly beneath the waters of Scapa Flow.

The British Navy had to be ready to meet both moves of the Germans and whether the High Seas Fleet was at sea or in harbour the Navy needed the co-operation of the Royal Naval Air Service. It was forthcoming, though the measure of it was limited. This was not due to any spirit of unwillingness—far from it. Every pilot and mechanic of the R.N.A.S. was anxious and eager at all times to have at the enemy. Nor was it due to caution or muddle in Whitehall. The simple fact was that no seaplane, aircraft-carrier, or airship of those days was sufficiently strong or sufficiently powerful to operate for any length of time in the conditions

THE FOUR FUNCTIONS OF THE R.N.A.S.

required by the Grand Fleet. The airships were too slow and too unwieldy, the seaplanes too fragile, while the art of taking-off from and alighting on to the deck of a ship remained, until the last year of the war, in its infancy. Nevertheless, the Royal Naval Air Service made every possible effort, and if, on more than one occasion, it was found necessary to take the will for the deed, that was the fault of the machines, not the men.

On the 15th May 1915 the First Sea Lord, Fisher, resigned, and his resignation was followed on the 26th by that of the First Lord, Winston Churchill. Their places were taken by Sir Henry Jackson and Arthur Balfour. It was for the second of these distinguished men to follow the powerful lead given by Churchill, who, throughout his term of office, had done everything in his power to encourage the development of the Admiralty Air Department. Balfour's first act was, quite properly, to get rid of all those semi-independent extraneous branches which had rendered very useful service, but had very little direct connexion with flying. He accordingly handed over to the Army the fifteen Armoured Car Squadrons, of whose exploits in France, Belgium, and the Dardanelles some account has already been given, three Armoured Trains, manned by the R.N.A.S. and operating in Flanders, and an anti-aircraft section which formed part of the Home Defence against air raids. Once rid of these important, but from its point of view secondary, organizations, the R.N.A.S. concentrated on fulfilling to the best of its ability the four main functions laid down for it on the 4th June by Sir John Jellicoe. It was to reconnoitre, to fight enemy aircraft, to defend from the air all naval centres, and to hunt submarines. Seven weeks later the stations of the R.N.A.S. were re-grouped and put under the orders of the Senior Naval Officer at each base, an air adviser being appointed to serve on his staff, while the Admiralty's Air Department was taken over by Rear-Admiral C. L. Vaughan-Lee, with Commodore Sueter in charge of aircraft construction.

The new Board of Admiralty began at once to face the threat to the Fleet of Germany's scouting Zeppelins. Here Admiral von Pohl, and subsequently Admiral Scheer, possessed a great advantage over Jellicoe. Their Zeppelins could go far out over the North Sea, discover and report the whereabouts and movements of the Grand Fleet many hours before our own cruisers and destroyers could provide the British Commander-in-Chief with similar information about the enemy. In other words, our fleet was without air support and, therefore, might have to fight blind, for, since the disaster to the *Mayfly* in September 1911, no airship had been designed or built for work with the Navy, while that of Germany could operate in exactly opposite conditions.

At the outbreak of war efforts were made to remedy this

EYES FOR THE NAVY

deficiency by the use of seaplanes carried on board vessels hastily converted for the purpose. Of these, the most important was the *Campania*, an old 20,000-ton Cunarder with a speed of about 22 knots. The others were smaller, cross-Channel steamers, whose first operation, on Christmas Day 1914, has already been recounted. The natural use to which naval aircraft could be put was that of reconnaissance, but to be successful this meant flying over the North German bases which were far out of the range of any land craft of those days. The seaplanes had, therefore, first to be brought into enemy waters, and this entailed the escort of the carriers by warships and the hazard of a considerable force to achieve a result which might, or might not, be worth while. During the next twelve months five attempts were made at armed reconnaissances over the bases of the enemy by seaplanes from carriers. All were failures. Nor was the attempt, on the 2nd June, to shoot down a Zeppelin by a seaplane carried by the light cruiser H.M.S. *Arethusa* more productive of results. In nearly every case, even a comparatively slight sea had been enough to prevent the seaplane from taking-off, or to destroy its floats. In this instance, though the Sopwith Schneider Cup machine carried by the *Arethusa* got safely into the air, the pilot, on reaching 1,800 feet, mistook the destroyer's smoke screen for the smoke recall signal and returned without engaging the Zeppelin.

Through all these months the *Campania* was exercising with the Grand Fleet, but again without any real success. Experiments with the battleship *Revenge* in spotting the fall of shot, had better fortune. On the 7th April a seaplane, which could not be seen from the ship, directed her fire, and at a range of 11,000 yards the target was hit almost at once. This feat was repeated the following day. These were the first occasions in history on which the fire of a British man-of-war was directed by an invisible air observer. A school for gun-spotting was forthwith established at Calshot. Nevertheless, though its development did not seem unpromising, it was only land aircraft and not seaplanes which proved able to direct the guns. Jellicoe was frankly pessimistic. Not even the successful take-off on the 16th August 1915 from the fore-deck of the *Campania*, made by Flight Lieutenant W. L. Welsh, caused the Admiral to change his opinion. Throughout these months, strenuous efforts were being made to complete at least three rigid airships capable of taking their place with the fleet, but it was not until the spring of 1917 that the first of them reached her war station.

The reconnaissance flights of aircraft from carriers in the North Sea were continued throughout 1916. They were combined with attacks on the Zeppelin bases. A notable attempt was made on

RAIDS ON HOYER AND TONDERN

the 25th March, when three Short and two Sopwith 'Baby' seaplanes, operating from a new carrier, the *Vindex*, sought to bomb the airship shed, thought to be at Hoyer on the Schleswig coast. The seaplanes got away at half-past five, and an hour and a half later two of them were seen through driving snow returning to the naval force commanded by Commodore Tyrwhitt. The pilots reported that the sheds were not at Hoyer, but at Tondern, and that the attempt to bomb them had failed. The other three seaplanes all fell into the hands of the enemy. One of them, piloted by Flight Lieutenant G. H. Reid, nearly escaped. He came down near the island of Sylt to help the pilot of one of the Sopwiths who had been forced down with engine trouble. Flight Lieutenant Reid picked him up and took off again, cheered by a number of Germans whose ignorance of seaplanes did not permit them to distinguish friend from foe. Unfortunately, the engine of Flight Lieutenant Reid's machine soon began to give trouble, and he was forced to alight. He taxied his machine for more than three hours in the general direction of England until its petrol was almost exhausted and its crew found themselves near a German sailing-boat. This they endeavoured to capture, but the sailing vessel was faster than the seaplane and drew away and they themselves were shortly afterwards taken prisoner by German soldiers in a motor-boat. This raid had one unexpected consequence. It stirred Admiral Scheer to action, and he put to sea. Jellicoe received due warning, and he, in his turn, steamed south-eastwards to meet the enemy. For the moment it seemed that the two mighty fleets would engage in battle as the indirect result of an unsuccessful raid by five small seaplanes, but long before the English Admiral could get within range, the Germans had turned and made off to their bases.

Since Tondern and not Hoyer was the home of Zeppelins, a raid was planned on it, and took place on the 4th May. Once more, however, the hard-working pilots of the seaplanes were to be cheated of their prey. Only three of them succeeded in getting their machines into the air, and one of them was killed almost immediately in a collision with the wireless aerial of a destroyer. The engine of the second soon gave trouble and forced the pilot to return. Only the third held on its course, reached Tondern, and dropped two 65-lb. bombs which missed the shed. Its occupant, however, the Zeppelin L.7, had, in the meantime, taken the air and appeared over the British light forces. Almost immediately it was hit by gun-fire from the light cruisers *Galatea* and *Phaeton*, and fell into the sea, where its destruction was completed by the gun of the British submarine E.31. Once again, as on the 25th March, Jellicoe had been waiting. Once again, the German High Seas Fleet failed to keep the rendezvous. But

THE HIGH SEAS FLEET COMES OUT

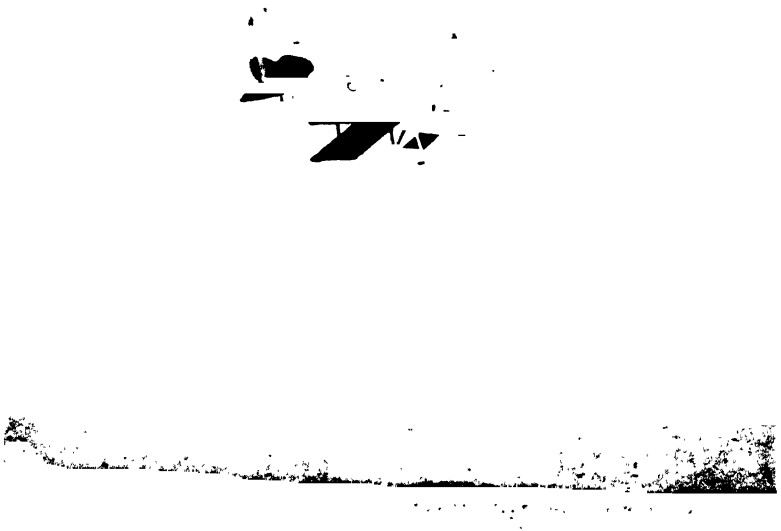
Admiral Scheer was, all this time, perfecting his plans for a sortie in force.

By the end of May all was ready, and the High Seas Fleet put out on the last day of the month. Fully warned of the intentions of the enemy, Jellicoe, with the Grand Fleet and the battle cruisers, had weighed half an hour before midnight on the 30th May. Though he did not know it, his seaplane-carrier, the *Campania*, was not with him. She had received the preliminary signals ordering her to raise steam to full speed, and these she had obeyed; what she had not received was the final and executive order sent at 10.54. This mistake was not discovered for some time, and it was not until two and a quarter hours later that her captain set out to catch up with the fleet.

Operating with the Battle Cruiser Fleet under Sir David Beatty was the aircraft-carrier *Engadine*. At half-past three in the afternoon of the 31st, an hour after the signal 'Enemy in sight' had been made by the *Galatea*, one of her seaplanes, piloted by Flight Lieutenant F. J. Rutland, took the air and reported the presence and course of three enemy cruisers and ten destroyers. At first they were seen to be steering north-west, but a quarter of an hour later the seaplane signalled that they had turned and were steering south. The *Engadine* tried to flash this important message to Beatty's flagship, the *Lion*, by means of a searchlight, but her signals were not seen. Fortunately, however, the cruiser *Galatea* had also observed the enemy's alteration of course, and the Battle Cruiser Squadron altered their course to conform. This solitary flight by one seaplane was the only assistance which the R.N.A.S. was able to give to the Grand Fleet at the battle of Jutland. Fog and mist prevented air reconnaissance; Admiral Jellicoe was unable to use his seaplanes, but the Zeppelins of Admiral Scheer were equally impotent.

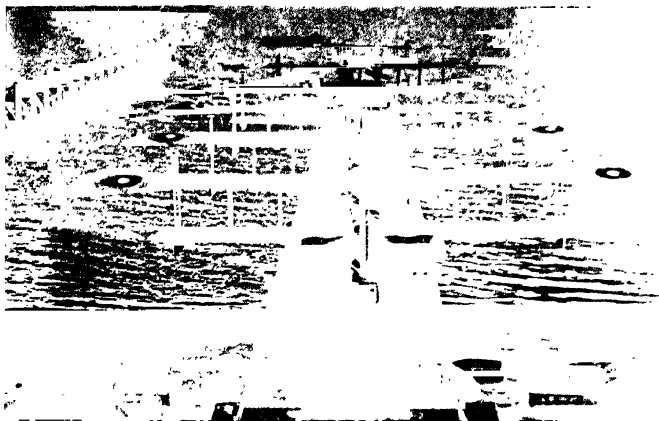
The next sortie of the German Fleet took place on the evening of the 18th August. Once more Jellicoe put to sea to meet them, and once more he was without the *Campania*, which had developed trouble in her engine-room. Nor was the *Engadine* with Beatty any more successful. Though visibility was excellent, the sea was running high and her seaplanes could not take off. In an attempt to do so, Flight Lieutenant Rutland broke the propeller of his Sopwith. A kite balloon, belonging to the *Campania*, which had been taken to sea by the battleship *Hercules*, was flown, but the *Hercules* was not with the advanced cruiser screen, but far to the rear, and the observers in the air saw nothing of the enemy.

A month later a different form of reconnaissance was attempted. This time an America flying-boat was sent to observe the German anchorage in the Schillig Roads. It was to be fuelled on the

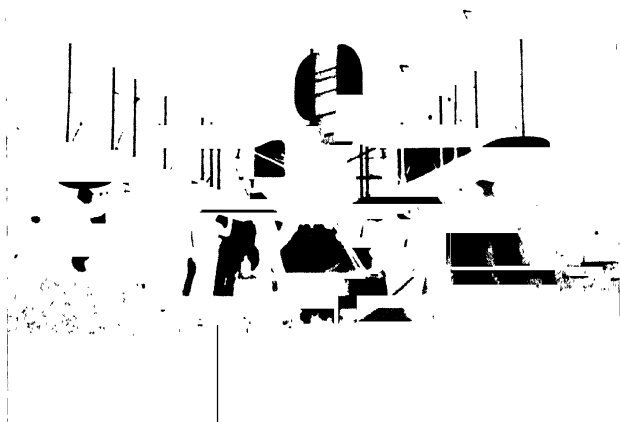


I.

1. Sopwith 'Baby' Seaplane in flight
2. F.2B Flying Boats on a slipway
3. F.2A Flying Boat in floating hangar



2.

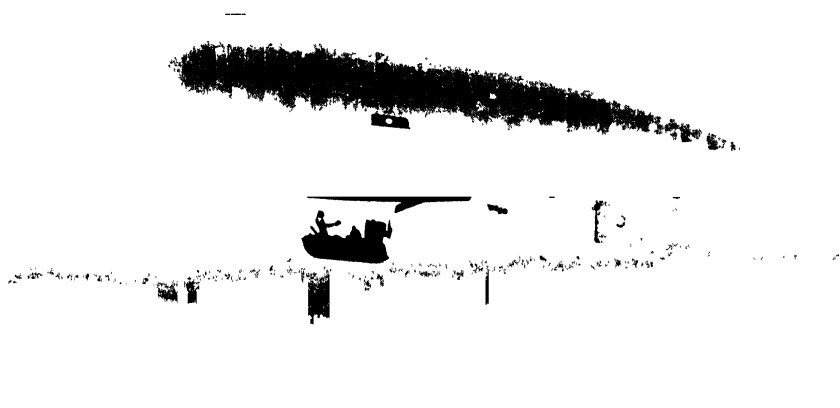




A Sopwith Pup alights on the deck of one of the earliest carriers

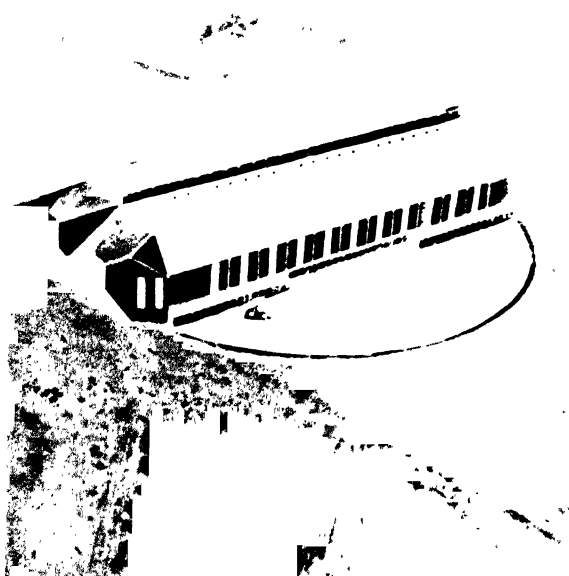
Air-Sea Rescue, old style. A Sopwith 2.F1, after landing in the water, is about to be hauled aboard a salvage lighter

The first successful attempt at flying a Sopwith Camel from a lighter towed by a destroyer (see page 252)





NAWAB SALAF UNG BAHADUR

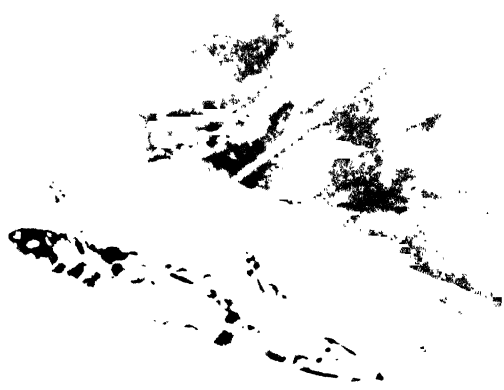




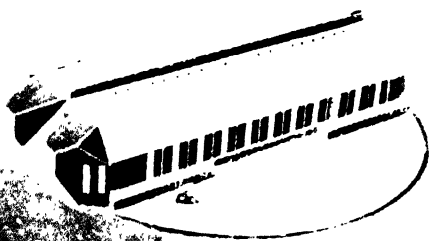
WING-COMMANDER SAMSON

(Above) A famous R.N.A.S. airman, Wing-Commander Samson, distinguished for his work with the armoured cars in Belgium, stands in front of two Nieuport scouts on the airfield at Tenedos

(Left) Targets of the R.N.A.S. The German cruiser, *Konigsberg*, was sunk in the Rufiji Delta, E. Africa, after a long duel with Fleet monitors for which R.N.A.S. seaplanes spotted (see pages 234-7). (Below) A Zeppelin Shed at Nordholz, S.W. of Cuxhaven



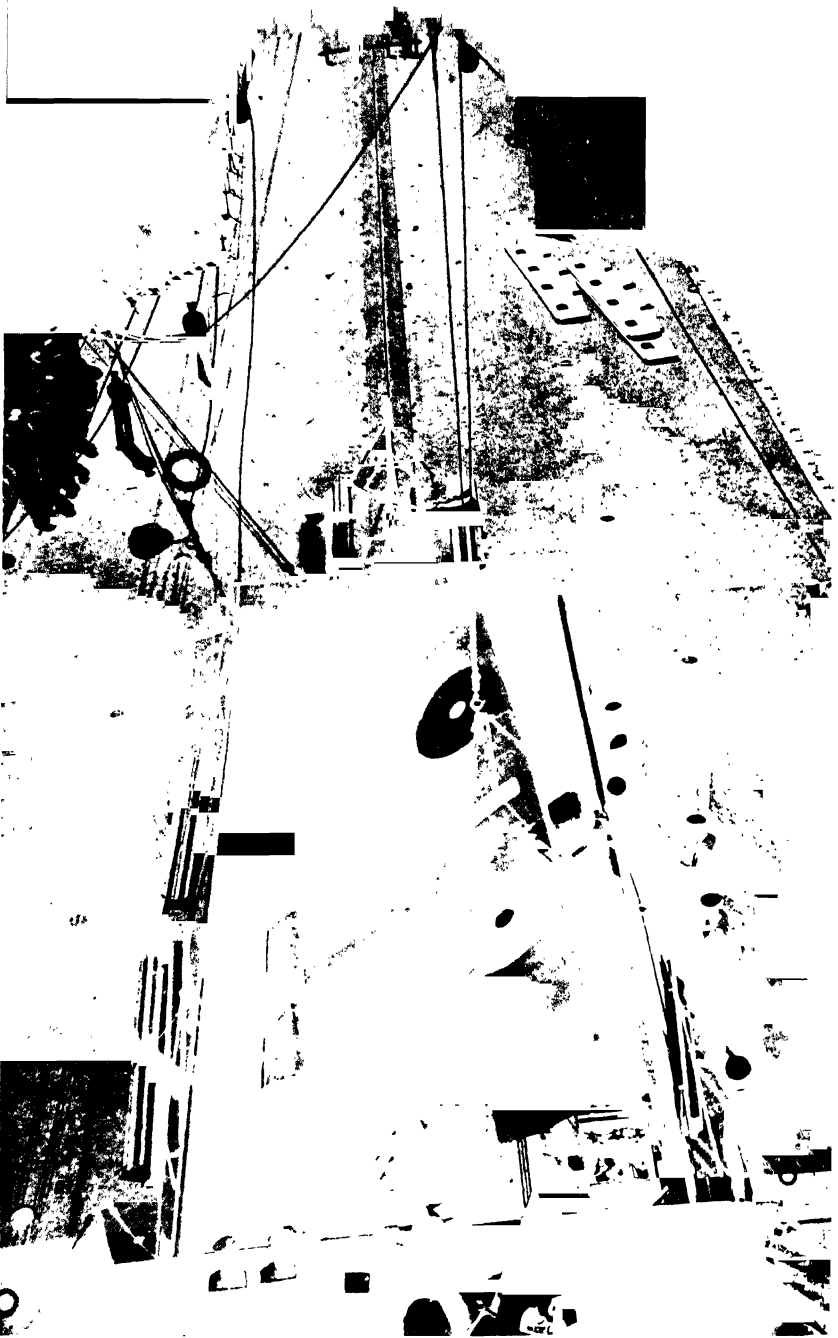
MAWAB SALAR JUNG EX HADIR





(Above) A famous R.N.A.S. airman, Wing-Commander Samson, distinguished for his work with the armoured cars in Belgium, stands in front of two Nieuport scouts on the airfield at Tenedos

(Left) Targets of the R.N.A.S. The German cruiser, *Konigsberg*, was sunk in the Rufiji Delta, E. Africa, after a long duel with Fleet monitors for which R.N.A.S. seaplanes spotted (see pages 234-7). (Below) A Zeppelin Shed at Nordholz, S.W. of Cuxhaven



H.M.S. *Furious*, a large light cruiser, was converted into an aircraft carrier in 1917. A flying deck, 228 feet long and 50 feet wide, stretched aft from her bows. A Sopwith Pup is being brought up from her hangar beneath the deck.

fighting ships. Much more success was achieved by fitting to light cruisers improvised platforms from which aircraft could take off. The first to receive such a platform was the *Yarmouth*, from which in June 1917 Flight Commander F. J. Rutland, the solitary air observer of the battle of Jutland, successfully took off a Sopwith Pup. Two months later this bold and successful experiment achieved a most practical result. On 21st August the *Yarmouth*, with the First Light Cruiser Squadron, was off the coast of Denmark when in the early morning a Zeppelin appeared. Flight Sub-Lieutenant B. A. Smart, though he had no previous practice, took the Sopwith Pup off the platform, climbed to 9,000 feet, and pursued the retreating airship. He delivered a series of attacks, the last one at a range of twenty yards. The Zeppelin, burning fiercely, fell into the sea. Smart returned to the *Yarmouth*, landing near it, but, since the squadron was in enemy waters, the Sopwith Pup had to be abandoned. After this success it was decided that one light cruiser in each squadron should be fitted with the newly designed 'flying-off' deck.

A month before this striking vindication of the policy of providing cruisers with aircraft, the *Furious* had joined the fleet. She took part in many sweeps off the Danish coast and the Heligoland Bight, but her aircraft, except for one unsuccessful attempt to attack a Zeppelin, saw no action. Their pilots, all of whom had soon become expert in taking-off, were determined to solve the problem of landing on the flying deck. On the 2nd August Squadron Commander E. H. Dunning, flying a Sopwith Pup, succeeded. The aircraft drifted over the centre line of the flight deck; rope toggles hanging from the wing tips, tail skid and fuselage were seized by a crew of officers who, at a signal from the pilot as he shut off his engine, hauled the aeroplane down and held it to the deck. Two days later Dunning was killed making a similar but this time unsuccessful landing.

Throughout that summer discussions in the Board of Admiralty concerning the air policy to be pursued by the Navy were frequent, and their Lordships were in constant consultation with the Commander-in-Chief. The exploit of the *Yarmouth's* Sopwith Pup had made a great impression, and autumn had not yet appeared before Beatty had committed himself to the view that all Grand Fleet heavier-than-air craft should be of the aeroplane type. While the Board of Admiralty were doing their best to find means which would make this possible, the ingenuity of Lieutenant-Commander C. H. B. Gowan came to their aid. He devised a method whereby an aeroplane could be flown off the gun-turrets of warships. The great advantage thus gained was that the launching platform could be turned into the 'felt' wind while the

THE FLEET DISCARDS ITS AIRSHIPS

ship held its course and place in the squadron. Experiments conducted on the *Repulse* were successful, and on the 1st October the indefatigable Rutland successfully took off in a Sopwith Pup from B turret. This was a great advance, and early in 1918 nine battle-cruisers and two light cruisers had been fitted with the necessary turret launching gear. Thus by the last year of the Four Years War the fleet was beginning to be provided, however imperfectly, with the means to fight the enemy in the air as well as on the sea. In November 1917 all its air service units were centralized and put under the command of a Rear-Admiral for Air, the first appointment being that of Rear-Admiral R. F. Phillimore who in January 1918 flew his flag in the *Repulse*. He was the first of a line of naval officers who were to command a whole series of aircraft-carriers which subsequently became, and still are, the floating homes of the Fleet Air Arm.

This chapter must end as it began, with a reference to airships. How the coastal airships, 'blimps' as they soon came to be called, carried out their monotonous but important patrols in protecting our convoys has already been seen. Towards the end of the war they were joined in work of a different kind by a number of larger or 'North Sea' types designed to patrol for at least twenty-four hours and to provide Admiral Beatty with services similar to those given by the Zeppelins to Admiral Scheer. By the end of 1917 six of them had been completed, but their performance fell below expectations. The fact was that a defect in the design of the power transmission gear was enough to make them virtually useless for the purpose for which they had been built. Nor were rigid airships more successful. Four eventually took the air, but not without difficulty. They had far too little lift, and it was quite impossible for them to carry out long patrols on behalf of the Grand Fleet. Thus, by the 11th November 1918, that fleet, in contrast to that of the enemy, had no airships, but could rely on ever increasingly efficient service from heavier-than-air craft based on such carriers as the *Furious*, *Angus*, *Pegasus*, and *Nairana*, and on land bases, while upon many of the great ships themselves reconnaissance and fast fighting aircraft stood ready to do battle against the large, far flying, but slow and cumbersome Zeppelin.

In accordance with tradition, Great Britain had once again followed the motto dear to Erasmus, *Festina Lente*. She had begun the war with an air arm so small and imperfect as to be almost without influence on events. She ended in the possession of a powerful force made up of machines which were steadily to develop in size and speed till they reached their full maturity twenty years later. Germany, on the other hand, had preferred to provide her Navy from the start with a huge, rigid,

lighter-than-air machine which could spy out the sea for many miles ahead and for many hours. Yet it failed, and by 1918 she was forced to realize that the Zeppelin had no future in it. In this new form of an age-old conflict David and Goliath had taken to the air. But the issue was still the same.

10. 'In that Decorum . . . Perfectly Instructed'

WE left the R.F.C. closely engaged with the enemy in France. Before their fortunes in 1917 and 1918 are described, a word must be said on the training of pilots. By the end of the Somme battle this had advanced considerably. The swift replacement by trained men of those who have fallen or been wounded in battle is always a major problem, but between 1914 and 1918 it was rendered particularly acute because a new weapon, and therefore new men to wield it, had been added to the armoury of war. Before 1917 was out the Army authorities had found it possible to put men into the trenches after only fifteen weeks of training. Whether such a course was justified or effective is beside the point; many thousands found themselves in the later stages of the war in the forefront of the battle with no longer a period of training behind them. This was not so with the Royal Flying Corps or the Royal Naval Air Service, except for one brief period when heavy casualties made replacement by fully qualified airmen impossible. Pilots to take the place of those put out of action could not spring fully armed and trained from the Central Flying School as Athene sprang from the head of Zeus. The process was necessarily a long one compared with that undergone by their comrades on the ground. It is to the credit of those in authority in 1914 that they tackled the question of training with resolution and dispatch. That they were able to do so was in great part due to the influence of the Chief of the Imperial General Staff, Lord Kitchener. He was from the first a warm supporter of the new Service, and his note of the 21st December 1914 in the margin of a memorandum proposing the creation of thirty-five squadrons, 'A.D.M.A. ought to be prepared to double this', clearly shewed the direction of his vision. Before the war was two months old, new squadrons began to spring up, and the policy was initiated of establishing reserve squadrons to train new pilots and new mechanics to form the nucleus of new formations. After undergoing their preliminary training the pilots passed through the Central Flying School and through various specialized courses of instruction at the Curragh and at Reading. There was also a special Lewis gun school at Hythe which rapidly became of great importance on the appearance of the camera gun, an invention producing a strip of photographs which, when developed, showed the pupil exactly at what he had aimed.

By the beginning of 1916 Brigadier-General J. M. Salmond had been put in charge of the training organization, and by the end of March it had been laid down that, to qualify, a pilot must

have flown at least fifteen hours solo in the air, carried out a cross-country flight of not less than sixty miles, landing twice during the flight, climbed to 6,000 feet, and then made a successful landing within a given space with his engine cut off, and made two successful landings in the dark. It must be emphasized that these requirements were held to be a minimum, and by the end of 1916 they had been made more drastic. Nevertheless, even this minimum schedule had to be temporarily abandoned in the spring of 1917. The need for rapid growth and the losses sustained in the closing phases of the Somme battle made it imperative to shorten the programme of training. Oswald Boelcke had been of great service to his country, and the casualties he and his pilots inflicted before his death had a considerable effect on the general situation. In addition to being able to fly the aircraft, the pupil had to pass tests in gunnery, artillery observation, bomb-dropping, and photography. Only then was he allowed to place upon his left breast the coveted wings of a fully qualified pilot.

Nor were observers neglected. In addition to the school of aerial gunnery at Hythe, they passed through a wireless school at Brooklands, where eventually all the rest of their training was concentrated. The provision of air mechanics was of equal importance, for the ultimate strength of the force depended of necessity on the number of aircraft which could be kept serviceable. Mechanics soon came to be recruited very largely through the good offices of the Regent Street Polytechnic. At the outbreak of war many might have been available immediately had any system then existed by which Army recruits could be earmarked to perform work for which they had special qualification. As it was, thousands of skilled mechanics were allowed to enlist in the ranks and were thus lost for ever in the wide embrace of the Army.

It must not be imagined that the problem of recruiting and training was easily solved. It was not. Up to June 1916 no very great difficulty arose, but when in that month Haig asked that the number of R.F.C. squadrons in France should reach fifty-six by the spring of the following year, the question of how they were to be manned became serious. The difficulties in connexion with the supply of machines will be discussed later in the chapter dealing with the creation of the Royal Air Force. They were, however, only part of the general problem. The discovery and correct use of skilled man-power was never easy. Trained men were needed by more than one Service. The Artillery, for instance, was short of artificers, and the Army Service Corps 'could do with quite a number of them'. Moreover, skilled workmen for the manufacture of the R.E.8s, Pups, Camels, and other types of new aircraft had to be found. The claims of manufacture had to be

A PROGRAMME OF EXPANSION

weighed against those of maintenance. Haig's proposals were received with some alarm in Whitehall, and it was at first proposed to give effect to half only of the suggested expansion. By November 1916, however, the War Office relented, and so eager or chastened was its mood, that it did not even blench when the Commander-in-Chief added twenty more fighter squadrons to his demands. Indeed, the Army Council appears to have out-Heroded Herod, for on the 12th December 1916 it formally approved the expansion of the Royal Flying Corps to 106 active and 95 reserve squadrons, to which two night-flying squadrons were added a few days later.

Various means were used to find the men needed for this expansion; unskilled men were given special training, the Dominions were combed for suitable recruits, so were the ranks of the Army and the factories; a number of squadrons, forerunners of the Empire Air Training Scheme of a generation later, were raised and maintained in Canada. The result of all this labour was not seen in its full glory until the appearance of the Royal Air Force in 1918; but it was this programme, drawn up by Trenchard and Haig two years earlier, which made possible the creation of that force, and it was with pilots trained on these lines that the battles of 1917 and 1918 were fought.

After the terrible fighting on the Somme had died away a pause ensued during which a new French Prime Minister, Monsieur Briand, and a new French Commander-in-Chief, General Nivelle, emerged upon the scene. The General's plans were to the highest degree ambitious. While the British and part of the French forces were to pin the enemy down in the North, his front was to be ruptured on the Aisne; through the gap would pour a great mass of trained men which, it was hoped, would overwhelm the enemy on the Western Front. The essence of the plan was that the initial break should be achieved in, at most, forty-eight hours. Before the assault could be delivered, however, the Germans retreated to the position soon to be known from one end of the world to the other as the Hindenburg Line. Their intention to do so had been suspected, for it was on the 25th February 1917 that six Sopwith Pups of No. 54 Squadron brought in clear information of the enemy's behaviour. On the 17th March the British army advanced across the ceded ground, and for some days found itself fighting, not in a complicated maze of trenches, but in open country. Squadrons of the Royal Flying Corps co-operated with the most forward troops throughout the advance, especially with the 4th and 5th Cavalry Divisions. During that brief period, from the 17th March to the 4th April, the main work of the R.F.C. was to supplement the ground system of communications by carrying messages.

Into the utter and tragic failure of the Nivelle offensive it is

THE ALBATROS WAS FASTER

not necessary to enter in detail, for the British armies, and therefore the R.F.C., had but a subordinate role to play. Haig's most important task was to capture the high ground known as the Vimy Ridge. The battle, fought by the First and Third British Armies, fell into two phases. At the outset they had for their support in the air twenty-five R.F.C. squadrons totalling 365 aircraft, of which one-third were single-seater fighters. Against these, the Germans could muster 195, of which half were fighters. The enemy possessed, however, one great advantage. His fighter pilots were flying Albatros and Halberstadt machines, superior in speed, climbing power, and armament to the De Havilland 2s with which our own pilots were equipped. A sentence such as 'the hostile scouts with their superior speed . . . were able throughout the fight to prevent the pilot from getting a single shot at any one of them', or words to that effect, are to be found in many of the combat reports of those days. Nor was the pusher F.E.2D any more effective against them, and, despite its 250 horse-power Rolls-Royce engine, even the Bristol fighter made an inauspicious début. On the 5th April, six of these were decisively defeated by von Richthofen at the head of five Albatros Scouts, and their leader, Captain Leefe Robinson, V.C., captured. This victory caused von Richthofen to express the view that the new British scout was no good, and in this he was followed by the whole German Air Force—later, as will be seen, to their cost. The fact was that the Bristol required skilful handling and its pilot experience before it could be manœuvred to the best advantage in a general engagement. This did not apply to the Sopwith Triplane or the Sopwith Pup, two single-seater fighters first used by the R.N.A.S. squadrons which had reinforced the R.F.C. in the later stages of the Somme battle.

Nevertheless, the casualties of the Royal Flying Corps during April and May of 1917 were high. This was due to a number of causes. In the first place there was a lack of first-class machines, the result of muddle and delay in production, a matter which will be discussed later. There was, too, the prevailing westerly wind which meant only too often a long struggle home after a fight which, owing to the wind, had drifted far over the enemy's lines. But the chief cause was the implacable determination of the Royal Flying Corps to pursue the offensive no matter what the cost. Every one of its pilots was well aware that to practise the doctrine of attack day in, day out, meant losses, and if the enemy were as skilled and resolute as, for example, Fliegerleutnant Werner Voss and his pilots, that those losses would be heavy. They were accepted without flinching. The mood of the officers and men of the Royal Flying Corps can best be depicted by a phrase used a generation later to describe the British people in a crisis even

graver. They were grim and gay. The first quality was displayed in the air, the second in Mess. However many empty chairs there might be, the spirit of relaxation, which tradition decreed must prevail after toil, was never allowed to depart from the board. Critics there were of this behaviour, persons belonging for the most part to an older generation, cold, unimaginative, and without understanding. To them Sir Walter Raleigh made an unanswerable reply, when he wrote: 'The Latin poet said that it is decorous to die for one's country; in that decorum the Service is perfectly instructed.'

The work of the R.F.C. during both phases of the battle of Arras was essentially the same. It maintained contact patrols whenever possible in order to report the progress of the infantry; it bombed back areas without very great success; it did valuable spotting for our artillery; and it did its utmost to prevent the German Air Force from crossing our lines. One example of air fighting may serve to illustrate its nature. On the 11th April Flight Sub-Lieutenant J. S. T. Fall, a naval pilot flying a Sopwith Pup, became engaged in a fight over Cambrai. Having sent down a Halberstadt out of control, he was attacked by three Albatros, and soon the four aircraft, three German and one British, were hotly engaged. Fall got on the tail of one of them and drew 'so close to him that the pilot's head filled the small ring in the Aldis sight. I saw three tracers actually go into the pilot's head.' By then Fall was within two hundred feet of the ground and under fire from German cavalry. Being alone, for the rest of the squadron had disappeared, he turned west, flying for home, and was repeatedly attacked by another Halberstadt, which he shook off several times by side-looping over him. These tactics were successful until the British pilot was within five minutes' flight of our lines. Then the Halberstadt made a particularly determined effort; but Fall was still ready. 'When he was about a hundred and fifty yards behind me I looped straight over him, and coming out of the loop I dived at him and fired a good long burst. I saw nearly all the tracers go into the pilot's back just on the edge of the cockpit. He immediately dived straight into the ground. . . . I landed at the first aerodrome I saw. . . . My machine was badly shot about.'

Another duty which the R.F.C. fulfilled whenever the weather made it possible was the interminable task of photographing the enemy's positions. This was accomplished mostly by the R.E.8, an aeroplane which on entry into service immediately acquired a bad reputation. It was fitted with a 150-h.p. Royal Aircraft Factory engine, and mounted a Vickers gun firing through the propeller operated by the pilot, and a Lewis gun fired by the observer in the rear. The early models showed a tendency to spin and there

VON RICHTHOFEN IN EVIDENCE

were a number of fatal accidents, so many, in fact, that pilots began to show a distinct lack of confidence when called upon to fly it. Lord Cowdray, then President of the Air Board, forthwith caused an exhaustive series of trials to be made, with the result that the design was so extensively modified as to transform it into what was almost a new aeroplane. After that its reputation improved, and it remained in the Service till the end of the war as the standard Corps reconnaissance machine.

The first phase of the battle ended on the 14th April, just as the enemy had been reinforced in the air. The weather had in general been bad and had therefore favoured the Germans. Only too often had their aircraft, by taking advantage of cloud layers, slipped under our high-flying patrols. The second phase opened on the 16th April, the same day as that on which the main French attack on which such high hopes had been based, was launched. It was a grim and terrible failure, and the losses of the French Army were so high that part of it mutinied and the general position of the Allies became extremely serious. The chief feature of this second phase was the difficulty experienced by the R.F.C. in discovering the whereabouts of the attacking infantry. Though pilots flew very low, only a few hundred feet above the battlefield, they were unable to see any flares for the simple reason that very often they were not lit. The fact was that the infantry often hesitated to make use of these means of communication lest their presence should be detected and enemy artillery put down a barrage.

It was during this second phase that the activities of von Richthofen were especially in evidence. It will be remembered that he was a friend and follower of Oswald Boelcke, and, though in the spring of 1917 he was not in command of his famous Circus, he was the leader of a number of single-seater Albatros fighters which did great execution. On the 28th April they encountered Harvey-Kelly, now a Major, flying a Spad and leading two others of No. 19 Squadron. In the ensuing fight Harvey-Kelly was shot down and died of his wounds a few days later. He had been the first pilot of the R.F.C. to land on French soil. That afternoon von Richthofen shot down a F.E.2B, which he claimed as his fiftieth victim, and before the day was out he and his brother Lothar accounted for two B.E.s. Altogether that day he shot down five British aircraft. The German Air Force continued to be vigorous until the 1st May, when von Richthofen returned to Germany on leave. Then its attack slackened, and the R.F.C. was quick to seize the advantage. By then it had become used to the new and better machines with which it was now equipped. Many of the difficulties connected with the S.E.5 and Bristol fighter, the D.H.4 and the Sopwith Pup had been overcome; our

FROM DUELS TO DOG-FIGHTS

pilots had gained experience in handling them and, with it, confidence. From the beginning of May casualties became appreciably fewer.

It is appropriate here to pause in the narration of the battle to consider the combatants, for by the spring of 1917 fighting in the air, which had begun with the encounter, more or less haphazard, of pilots armed with rifles or revolvers, had now developed into the rudiments of a scientific method of combat. The fitting of machine and Lewis guns to aircraft and the perfecting of the interrupter gear had made possible a form of aerial duelling which, since it took place in an element not yet entirely mastered by man, was necessarily of a desperate character, and only too often meant death for the vanquished, and sometimes for the victor. Casualties on both sides were therefore high in comparison with the numbers engaged. The introduction of formation flying at the beginning of 1916 marked a further stage in aerial warfare. From that time onwards the single fighter pilot, ranging the sky for an occasion to attack the enemy, was the exception rather than the rule. In the last two years of the war, fighters went out in groups of as many as thirty or forty, and attacked or were attacked by the enemy; such an action was generally described as a dog-fight. 'I started with thirty planes in my squadron and flew to the front, commanding three Staffels at 5,300 metres height,' runs a combat report of von Richthofen dated the 8th March 1918. 'Just as we were approaching the front I saw several English squadrons crossing our lines.' There are many similar phrases in the reports from both sides, with this important difference: those from the German pilots very rarely record that the battle occurred in any place other than over their own areas. More than once has reference been made to the habit of the Royal Flying Corps, later the Royal Air Force, of seeking combat above the territory of the foe. This spirit of attack engendered from the very beginning by commanding officers like Trenchard, Brooke-Popham, Harvey-Kelly, Mannock, and many more, soon became a habit among the select band of young airmen whose skilled hands flew the Camels, the S.E.5s, the Bristol fighters, and the D.H.4s, and the *élite* of the British race went to war in the firm conviction that Danton's proud advice, '*L'audace, encore de l'audace et toujours de l'audace*' spelt victory. Not that their opponents were guilty of irresolution; far from it. Von Richthofen, Werner Voss, von Schleich, even Hermann Goering, were magnificent fighters. And yet it is of interest to contrast their psychology with that of British airmen such as McCudden, Mannock, and Ball.

It was the German practice to make national heroes out of their most renowned pilots. The fame of such men as Boelcke and von Richthofen spread from one end of Germany to the other.

No such policy was pursued on this side of the Channel. Pilots who had particularly distinguished themselves were well known throughout the R.F.C., but, save when one of them received from the hands of the King a very high distinction, such as the Victoria Cross, the general public knew little of them. To compare Manfred von Richthofen with Edward Mannock is to go some way towards explaining the difference between the German mentality and our own. Both were killed in 1918, within a few months of each other, but Mannock was the elder by five years. Like Boelcke, he was the first airman to realize the supreme importance of applying tactics to formation flying. Von Richthofen had been trained in such tactics from the start, for he was the friend and pupil of Boelcke. But the main difference between the two airmen lay in the fact that, despite his apparent dash and ferocity, the German was primarily a defensive fighter. An analysis of the eighty victories he claimed shows that fifty of his victims were two-seater machines, far slower than his fast, blood-red Albatros triplane. Of the remainder, nearly every one had a performance inferior to this machine and the number of S.E.5s, Sopwith Triplanes or Camels which were in the same class as his Albatros and which he destroyed, was very few. It was, indeed, von Richthofen's practice to attack, whenever he could, isolated, slow two-seaters whose pilots were too venturesome. No one was better aware of this than the German airman himself, who, for all his boasting—and his autobiography, completed a few weeks before his death, is couched in Ercles' vein—admitted that 'it is better for one's customers to come to one's shop than to have to look for them', and maintained that the happiest period of his life was during the battle of the Somme when 'in the morning, as soon as I got up, the first Englishman arrived, and the last disappeared only after sunset'. Brave though he was, von Richthofen made more than one exaggerated claim, and never, if he could avoid it, gave credit to a comrade for a victory. He was even jealous of his own brother, and his demeanour to young pilots shewed the man. One day when chatting on the aerodrome at Douai, a number of S.E.5s arrived overhead. Von Richthofen beckoned to a newly joined pilot, and, pointing to the R.F.C. machines, rapped out: 'You see those enemies up there? Go and kill them or be killed.' A few minutes later the young pilot had fulfilled the second part of the order.

Mannock presents a marked contrast. He displayed all the traditional diffidence of the British man of action. Joining No. 40 Squadron in April 1917, it took him some little time before he began his career of victory. He was a bad marksman, and only assiduous practice made it possible for him to fly in formation. But he persevered and presently began to acquire a reputation

MANNOCK FOUGHT TO KILL

even among such ardent spirits as the fighter pilots of the R.F.C. In command of a flight, he was adamant in refusing to allow any of its members to leave formation except for engine trouble, and he once fired a burst at a pilot who was rash enough to do so. From first to last he had a concentration of purpose that amounted almost to mania. He was not afraid to own himself afraid. His dictum: 'The will can always triumph over matter during the early stages of a nervous disability, particularly when that disability is only fear', can be taken as the motto of his class of fighter. Von Richthofen would never have admitted what he would have stigmatized as a failing, though there is abundant evidence to shew that in common with all air-fighters, he suffered at times from the effects of strain acting upon a vivid imagination. Both the British and the German pilot, for example, shared with others of their kind a horror of fire; a burning machine falling in flames down the sky was a terrible sight, and when Mannock saw one in that condition, carrying one of his friends, he wrote that night in his diary: 'I hope he blew out his brains.'

As his career developed and his tactics of forming a single attacking unit proved more and more successful, Mannock's victories became more and more numerous, till he was shooting down an average of one German aircraft a day. His own feelings towards the enemy tended to concentrate on hatred of everything that Germany stood for. Towards the end of his career he thought of nothing but killing Germans, whom he regarded as noxious vermin, an opinion shared by many before his day and since. It was this spirit which, multiplied as it was ten thousand times throughout the fighting services, made victory certain. He had little use for so-called chivalry and was frankly delighted when the news of von Richthofen's death was brought to his Mess; nor would he drink to the health of the dead Baron. The Knights of the Air, as a number of contemporary journalists and subsequent writers of the sentimental, mawkish school conspired to call them, showed, in actual fact, little mercy in combat. They fought to kill, and neither expected nor received quarter. That a spirit of good fellowship was often shewn to a rival when taken prisoner meant nothing, and, as far as can be ascertained, there is no recorded instance in which a display of chivalry on one side or the other saved the life of a British or German airman when engaged in combat. On the other hand, observers escaping by parachute from the baskets of their balloons were left unmolested.

In his treatment of his own comrades, Mannock was very different from von Richthofen. He would never make a claim for a personal victory if it could be given to some one else, and his claim to have shot down seventy-two German aircraft was certainly conservative. His anxiety to teach and encourage young

'I SHALL BE IN GOOD COMPANY'

pilots was notorious, and it was in initiating one of them into the intricacies of air-fighting that he met his own death. Yet to cowards or to persons whom he suspected of cowardice he could be ruthless, and it is recorded of him that, when one of his pilots shewed himself unable to brave a fight in the air and said so, Mannock caused his wings to be torn off and a piece of yellow cloth to be substituted. In this he may have displayed the state of his own nerves. Such a gesture was, perhaps, no more than one of the symptoms of a disease common enough among the fighting pilots of both sides. The nervous strain under which they lived was very great, and though both the British and the German authorities did all they could to ease it by the grant of frequent periods of leave, they could not overcome the inevitable shrinking of the human spirit from conditions without precedent in warfare. Yet Mannock's cry to a friend: 'Old lad, if I am killed I shall be in good company. I feel I have done my duty', might have come from the lips of any pilot of those days or of these. It was a true echo of Nelson's last words. Of such stuff were the men who on both sides were sustaining the war in the air. But few survived, nearly every one of them passing from the roar and turmoil of the fray 'to wander as a greatened ghost elsewhere'. Yet their example was infectious, and it is for that reason, if for no other, that their mental attitude is of importance in the correct understanding of the struggle.

It is time to return to the battle itself.

The opening days of May 1917 were distinguished by attacks on balloons, intensive bombing, and air-fighting. It was then that the first low-flying tactics as distinct from those employed on contact patrol were used. At 9 a.m. on the 2nd, six Nieuport pilots of No. 40 Squadron crossed the German lines at a height of fifty feet. They 'hedge-hopped' or 'contour-chased'—both expressions came into use about that time—till they reached the German balloon lines where their attack came as a complete surprise. Eight balloons were aloft; all were hit and four completely destroyed. The next day, in support of an unsuccessful infantry attack on Bullecourt, bombing raids on enemy dumps, aerodromes, and trains were made, with considerable success. The bombing aeroplane at that time, and, indeed, until the creation of the Independent Air Force, was used as a long-range gun to bombard targets out of reach of our artillery. As such its success, though variable, was in general reasonably effective considering the limitations imposed by the weather and the size and number of the bombs carried. It was not until the last few months of the war that the possibilities of strategical bombing were explored. That was inevitable having regard to the size and power of the machines in service in 1917. Not until the big Handley Pages,

ALBERT BALL IS KILLED

themselves a counter-blast to the German Gothas and Giants, came into action did attacks on far-distant industrial targets become possible.

It was during those bright May days that Captain Albert Ball met his death. On the 5th May he had destroyed two German machines by using his two favourite manœuvres. Allowing the enemy to get on his tail, he was wont to gauge the distance to a hair's-breadth and turn sharply just before the German opened fire; he would then come up underneath him and attack from a blind spot. He followed that course on this occasion and the first German machine was disposed of. Ball then found himself flying straight at the second, and this enabled him to practise his other chosen form of tactics, to fly head on against the enemy in the certainty that if he held on long enough the German pilot would at the last moment flinch and turn away. A sharp burst was then usually enough to cause his destruction. So it proved that evening; the two machines were on the point of colliding when the German began to turn, was at once hit, and crashed within a few hundred yards of Ball's first victim. These two were his last. Two days later Ball himself was dead.

The 7th May had seen much activity in the air. In the morning the Nieuports repeated their success against balloons, shooting down seven. In the evening determined attempts, notably by No. 56 Squadron, were made to bring the Germans to battle. It was after eight o'clock and dusk was at hand when Ball and Captain Crowe, flying S.E.5s, met at a pre-arranged rendezvous after a confused and unsatisfactory battle with Red Albatros fighters near Cambrai. For some time they flew together until, near Loos, Ball was seen to fire two Very lights and then dive on to a red triplane. Crowe and a third British pilot flying a Spad joined in, but the German and Ball disappeared into a cloud-bank and were not seen again. The red triplane was piloted by Lothar von Richthofen, the brother of Manfred. He landed with his petrol tanks shot to pieces, but claimed that he had shot down the British airman. This was probably true, though there is some evidence to show that Ball's S.E.5 had been hit by anti-aircraft fire. Albert Ball was posthumously awarded the Victoria Cross. Like Mannock, who was to be killed a year later, he was supreme in his resolution to attack, to continue to attack, and not to cease to attack till the enemy was destroyed or in flight. His forty-three certain victories were all gained in this manner. 'Ball was quite a simple little man', wrote a member of his squadron. 'His one relaxation was the violin, and his favourite after-dinner amusement to light a red magnesium flare outside his hut and walk round it in his pyjamas, fiddling. He was meticulous in the care of his machine, guns, and in the examination of his ammunition.

TO DOMINATE THE ENEMY LINES

He never flew for amusement.' For him, as for others of his breed, war was a grim, futile occupation, but one which, once undertaken, must be carried through to the end whatever the cost.

The spring offensive carried out by the French armies on the Aisne had been a disastrous failure, and in May the Allied High Command decided to transfer the main theatre of the attack to Flanders, though Haig's plans for the offensive were not finally approved by the British Government until the 20th July. Lloyd George, the Prime Minister, had been from the first dubious about the prospects of success, and events fully justified his forebodings. That summer was to witness 'a profligate wastage of some of our finest young manhood'. On the other hand, if the French were to be kept in the field, a strenuous British effort was almost certainly necessary. The serious mutinies in the ranks of the French army, though quelled by Pétain, who on that occasion contrived by accident to be of signal service to his country and her allies, had profoundly affected the armed forces of the French Republic. A strong diversionary attack was necessary, but as so often happens in war, it soon absorbed more and more of our energies until the casualties had 'mounted up to the huge total of three hundred thousand'.

As on the Somme the summer before, the R.F.C. had a front seat in the unfolding of the new tragedy. The first act at Messines was successful, but subsequent acts were played on a waste of mud and shell-holes, where to miss the tenuous duckboard path meant only too often death by drowning or suffocation. Overhead hung dull and lowering skies from which fell a pitiless rain, so that even the elements seemed our foes. None realized this more keenly than the Royal Flying Corps. It had mustered for the battle fifty squadrons, comprising 881 aircraft and forty kite balloon sections. Trenchard's strategy, tested on the Somme, was to be further extended and developed. Based on the principle of the continuous offensive, his aim was to dominate the enemy battle area, bounded on the one side by the enemy's front line, and on the other by the line of his balloons some ten thousand yards in the rear. Effectively to patrol this area would make it possible for the Corps machines, working with the guns, to destroy enemy batteries, while fighters from the Army Wings were instructed to keep enemy air observers away from the battle-field, thus making it difficult, if not impossible, for German artillery to range accurately. No enemy aircraft was to be allowed to cross the German balloon lines along a stretch of seventeen miles from Perenchies to Langemarck. The line was divided into two beats, northern and southern, and continuously patrolled from dawn to dusk at a height of fifteen thousand feet, while patrols of six to

WIRELESS INTERCEPTION

eight fighters flew at twelve thousand over the central section of the line where, on the 7th June, the battle opened.

By then the embryo wireless interception organization had been expanded. The method used was for the Army wireless station to take bearings on all German aircraft using wireless, and report their probable position to the nearest R.F.C. headquarters. The approximate area in which German aircraft were flying could thus be determined and ground signals made to the nearest British fighter pilot, all of whom had been instructed to keep a watch for them. By May 1917 the system had proved its worth, and each army was then allotted two Aeroplane Compass Stations and one Aeroplane Intercepting Station. They soon demonstrated their value, and, working in conjunction with trained intelligence officers, began to supply important information concerning not only German air patrols but also the activities of German batteries. 'A "black list" was drawn up of all wireless calls which experience shewed to presage important activity, and special attention was directed to a hostile aeroplane immediately a "black list" call was intercepted by the compass station.' In the first week of the battle, compass stations discovered sixty-two hostile aircraft directing the fire of batteries, and succeeded on forty-seven occasions in passing on this information to the R.F.C. with the result that in twenty-two instances the German 'shoot' was brought to an abrupt conclusion.

At dawn on the morning of the 7th June the nineteen mines driven under Messines Ridge by tunnelling companies, which had been working on them since the previous January, were exploded, the barrage opened, and the assault was launched. At once the work of contact patrol was resumed, the aircraft being kept informed by the infantry of their whereabouts by means of flares. Because of their green colour these were not easily visible once the sun was up, and greater success was obtained by the use of the Watson fan, a disc which, when rotated, was easily seen. In general, the R.F.C. had no great difficulty in following the battle, for most, though not all, of the infantry did not hesitate to signal their position. Considerable progress was made, and by the end of the day all objectives had been captured and consolidated except for an area east of Messines. The most serious counter-measure, an enemy attack on the II Anzac Corps, was wiped out by artillery fire before it could develop, for the troops massing to take part in it had been seen by a balloon observer. It was on this day that Captain W. A. Bishop of No. 60 Squadron won the Victoria Cross by destroying four out of seven aeroplanes he discovered on an airfield near Cambrai.

The battle of Messines was virtually over at the end of the first day. It has justly been described as a tactical masterpiece. The

MESSINES—A TACTICAL MASTERPIECE

victory was due in large measure to the handling of the artillery, which in its turn was enabled to find its targets by the close co-operation of the R.F.C. How close this was will be realized from the following example—one of many. A German battery was reported active east of the Messines Ridge and was immediately engaged under the observation of an air observer. It moved at once but its move was reported while in progress and it was again subjected to fire. Noting that this was not wholly effective, since the German battery was still in action, the R.F.C. observer sent a special call bringing to bear the fire of a battery with which he had previously arranged liaison. The German guns were then destroyed, and it was this somewhat elaborate but most effective method of co-operation which ensured their destruction.

Once more the R.F.C. had been successful, despite the sudden introduction into the handling of it of a political consideration which, for the moment at least, hampered its action on the field of battle. On the 21st June two of its foremost fighter squadrons, Nos. 56 and 66, were withdrawn from the struggle, the first being sent to England, the second to Calais. Eight days previously, German Gotha long-range bombers had made their first daylight raid on London. The resulting agitation was considerable and amounted in Government circles to panic. The Cabinet at once ordered the return of these squadrons, even though it was aware from the immediate protests of Haig that this step would weaken the Flying Corps in France at a critical moment. Their departure was all the more serious, for von Richthofen had reappeared in Flanders and was making his presence felt. Moreover, the replacement of casualties in the R.F.C. had become a serious problem. 'My reserve at present is dangerously low,' wrote Trenchard to his brigade commanders on the 10th June, 'and the supply from home is not coming forward sufficiently freely to enable us to continue fighting an offensive in the air continuously', but he was quick to add: 'It is of the utmost importance, however, that the offensive spirit is maintained in the Flying Corps.' Why it was necessary for him to write as he did will be explained later.

The attack on the Messines Ridge was subsidiary. It was also the only success scored that summer. Of the subsequent battles the less said the better. It will be recollected that the offensive had been switched from the southern to the northern half of the British front. Haig's object was the occupation of the Belgian coast as far as the frontier of Holland. This was to be effected by an advance of which the ultimate goal was the capture of the Roulers-Thourout railway, followed by a landing between the River Yser and Ostend. In order to take the railway, however,

RICHTHOFEN'S CIRCUS

it was vital to obtain possession of the Passchendaele-Staden ridge, and it was here that the plan failed. A combination of a stubborn German defence maintained largely from concrete pill-boxes, now making their first appearance in warfare, and most unseasonable weather, defeated these optimistic projects.

To support them the R.F.C. and the R.N.A.S., together with the French and Belgian air services, were able to muster 852 aircraft. Against them, approximately 600 aircraft had been collected by the German Fourth Army Commander, but they included von Richthofen's new squadrons of four flights of fighters. The German leader was for some time out of action, for on the 6th July he had encountered an F.E.2d flown by Captain D. C. Cunnell, with 2nd Lieut. A. E. Woodbridge as his observer. A bullet from Woodbridge's Lewis gun cut a groove in von Richthofen's head, but the German, temporarily blinded and paralysed, succeeded nevertheless in making a landing. He was taken to hospital, and by the 16th August was again in action.

The Allied offensive in Flanders opened inauspiciously. While it was still under preparation the Germans delivered a surprise attack near the coast in the Lombartzyde sector. Taking advantage of bad visibility—there was ground mist and cloud down to 900 feet on the 7th, 8th, and 9th July—the enemy attacked in the evening of the 10th July and by noon the next day had captured the east bank of the Yser from its mouth to Nieuport. In so doing he inflicted casualties on the British Army amounting to 126 officers and 3,000 men. As cover for their advance the Germans added by the use of smoke-screens to the difficulties of visibility caused by low cloud. Both their air force and their artillery shewed great activity, the last protecting itself from the observation of No. 52 Squadron by smoke-pots placed round its main batteries.

The air offensive opened on the 11th July. As soon as it was launched, air fighting on a considerable scale developed. On the first day nine British aircraft were lost as against fourteen German, and for the rest of the month the R.F.C. brought all possible pressure to bear on the enemy's air force, reinforced as it had been by von Richthofen's newly created circus based on aerodromes near Courtrai. This consisted of Jagdstaffeln Nos. 4, 6, 10 and 11, the aircraft of which were painted every kind of vivid colour. Von Richthofen himself favoured a blood-red Albatros, and of the other aircraft he led to war some had yellow noses, blue bodies, and green wings, some were painted pale blue beneath and black on top, and others were camouflaged by streaks or spots. They were frequently in action, and indeed the air fighting in those July days reached a pitch not before equalled. On the 26th, for example, ninety-four single seaters whirled in combat above

THE FIRST FIGHTER-BOMBERS

Polygon Wood. On the next day a general engagement was fought between sixty-seven British aircraft and an inferior number of German. The combat lasted for more than an hour and resulted in a British victory, in which the pilots and observers of the F.E.2s were particularly successful. These pusher aircraft, armed with three Lewis guns, destroyed six of the enemy for the loss of one pilot wounded; the triplanes of the naval squadrons, which had already done very good work in June, destroyed two, and the S.E.5s of No. 56, one. It had been a remarkable display of British air power and it drew congratulations from Haig, who commented with warm appreciation on 'the strenuous efforts which have been made to obtain this grand result'.

Dawn on the 31st July saw the opening of the British attack from the River Lys in the south to the flooded area round St. Jansboek in the north. It was carried out by the Fifth Army, with the Second Army on its right and the French First Army on its left, and was at first reasonably successful despite strong German counter-attacks supported by low-flying aircraft. The co-operation of the R.F.C. was far from perfect, but this was due to the atrocious weather, low clouds hanging all the morning over the battle-field, and in the afternoon discharging rain. A new element in the assistance the Corps afforded to the Army was to be seen in the dispatch of fighter aircraft carrying four 25-lb. Cooper bombs to attack enemy aerodromes with the object of keeping fighters on the ground in the early stages of the attack. There was considerable doubt whether the S.E.5s thus loaded would be equal to the task, for no special bomb racks had been designed and the sudden addition of a hundred pounds of explosive upset the flying capabilities of the aircraft. The adventures of Lieutenant R. A. Maybery of No. 56 Squadron, flying an S.E.5 loaded in this manner are therefore of some interest.

He crossed the line near Ypres at five hundred feet and, descending to thirty, made for the aerodrome at Heule, from which objective he was turned back by the persistent attacks of two enemy aircraft. Eventually, after driving him over our lines, they made off and he at once turned round and made again for the aerodrome, which he circled at two hundred feet. He then dropped his first bomb, which hit one of the aeroplane sheds. 'This', he said in his report, 'caused immense excitement, and I could see people running about all round the sheds.' He hit two more with his second and third bombs, and put the fourth bomb on Courtrai railway station a short distance away. He then went back to the aerodrome and flew straight across it, firing his Lewis guns into the sheds from a height of twenty feet. At one time he came so low that he 'actually touched the ground'. He next went

GROUND-STRAFING

on to another aerodrome nearby, sprayed with bullets a machine being taken out of its shed, and caused the horses of two German officers to bolt with their riders. He then machine-gunned a column of infantry marching in the direction of Menin, and zooming up 'fired half a drum into an enemy aircraft which started down in a steep left-handed turn'. He finished this off with his Vickers gun, and as a final gesture shot up a passenger train coming towards Courtrai. So ended a brisk morning's work. Nor was he the only R.F.C. pilot to engage in such activities. Another attacked a staff motor-car which replied with revolver fire; a third caused casualties among troops crossing a bridge, and a fourth scattered a party of infantry some fifty strong marching down a road.

Under such low-flying attacks the German infantry shewed signs of demoralization, but the assaults would have been still more effective had the co-operation with our attacking infantry been greater, for their effect quickly passed off, and to be of real value they should have been supplemented by infantry. The fact was that the British Army was still slow to grasp the possibilities and limitations of air support. When attacked by low-flying German aircraft it demanded immediate protection, not realizing that the aeroplane was a weapon not of defence but of offence, and that to use it to drive away aircraft of the enemy similarly employed was a waste. The infantry may perhaps be excused. They were fighting a battle which for difficulty, nay for desperation, has seldom been equalled in the annals of war. 'The low-lying, clayey soil', said their commander in one of his dispatches, 'torn by shells and sodden with rain, turned to a succession of muddy pools. The valleys were speedily transformed into long stretches of bogs impassable except for a few well-defined tracks. . . . To leave them was to risk death by drowning, and in the course of subsequent fighting on several occasions both men and animals were lost in this way.' Throughout that summer the British infantry continued to plod on, or, more accurately, to mark time, for, despite all that the R.F.C. could do, the achievement of a decisive result was out of the question.

On the 15th August, Hill Seventy was captured, and the counter-attacks organized by the enemy were largely brought to naught by the activities of the pilots and observers of No. 43 Squadron, 'who engaged a large number of targets of all descriptions with machine-gun fire and kept the Corps headquarters and Corps heavy artillery constantly informed . . . of hostile concentrations for counter-attacks'. On the next day the battle of Langemarck opened and endured for three days despite 'low clouds, mist, and smoke drifting over the battle-field'. Its progress was reported by the contact patrol observers of Nos. 9, 7, 21, and

THE MENIN RIDGE

4 Squadrons. A machine of the last-named was hit by shell-fire, its wireless and most of its controls being shattered. The pilot, however, coaxed the aircraft to divisional headquarters, upon which the observer dropped a hastily scribbled message telling of German preparations for a counter-attack.

Between the 18th August and 20th September a lull ensued, enforced as much by the bad weather as by the exhaustion of the attacking troops. The ridge along the Menin road was the next objective and the R.F.C. was detailed to play its usual part, extended on this occasion to include the destruction of rest billets housing reserve troops, the dislocation of railway communications, the bombing of aerodromes, and the hampering of counter-attacks. That these tasks were not fully carried out was once more due to the weather. On the eve of the battle rain began to fall and continued throughout the night, giving place at dawn to a wet mist which obscured everything and everybody. It was not until 8 a.m. that it lifted sufficiently for single-seater fighters from the Second and Fifth Armies and from the headquarters of the 9th Wing to go out to the attack of German positions from the height of a hundred feet or less. They dropped sixty-seven 25-lb. bombs that day and fired more than twenty-eight thousand rounds on targets which included troops drilling and on the march, motor-cars, batteries, and kite balloons.

The experiences of the pilots were many and varied. One of No. 70 Squadron, flying a Camel, attacked a column of horse transport, entirely disorganizing it; another from No. 29 Squadron pursued two German machine-guns whose crews leapt from shell-hole to shell-hole seeking vainly for cover till they died. No less than eight attempted counter-attacks were broken up by artillery fire directed against them from the air, and concentrated bombing attacks were made by day and at night by the light of parachute flares on the Menin-Ypres road, crowded with troops and vehicles. On the 23rd, Captain J. T. B. McCudden of No. 56 Squadron, to be awarded the Victoria Cross and to die in a crash a year later, fought seven German aircraft single-handed till he was joined by 2nd Lieut. A. P. F. Rhys-Davids of the same squadron, who engaged in close and fierce combat with a red-nosed Albatros which was eventually shot down from a range of thirty yards. Its pilot was Fliegerleutnant Werner Voss, of whom McCudden wrote: 'His flying was wonderful, his courage magnificent, and in my opinion he was the bravest German airman whom it has been my privilege to see fight.'

The Menin Ridge battle was followed by that of Polygon Wood, begun on the 26th September, on a day when as usual 'the clouds were low and made difficult the work of the co-operating aircraft'. Nevertheless the R.F.C. succeeded in playing its customary part,

NO. 56 SQUADRON

and the practice of supplying its pilots with tactical maps shewing the points at which the enemy was likely to assemble for counter-attack proved very successful. 'Many parties of German infantry massing behind the battle-front were found and scattered with light-weight bombs and machine-gun fire.' Much of the success in this and previous battles was achieved by the famous No. 56 Squadron which, by the 30th September, had brought down two hundred German machines destroyed or out of control. So fierce and resolute were its pilots that the German air force believed that they had been specially recruited with the object of combatting von Richthofen's famous Circus. This was not so; they were merely typical of the R.F.C. as a whole and differed from other fighter squadrons only in the larger measure of good fortune which had befallen them in the matter of suitable targets.

It was not until the beginning of October that Haig finally decided that the objectives which he had set himself, the sea bases on the Belgian coast, were not to be gained. By the 4th, the British line had advanced an average of nine thousand yards at appalling cost. No more was possible. The weather was worse than ever, especially on the 9th and 12th October, when the chief damage to the enemy was caused by low-flying machine-gun and bombing attacks carried out by forty-one pilots from ten different squadrons. Desultory fighting in Flanders continued throughout the month, mainly with the object of distracting the enemy, for by then the decision to attack near Cambrai by a massed force of tanks had been taken.

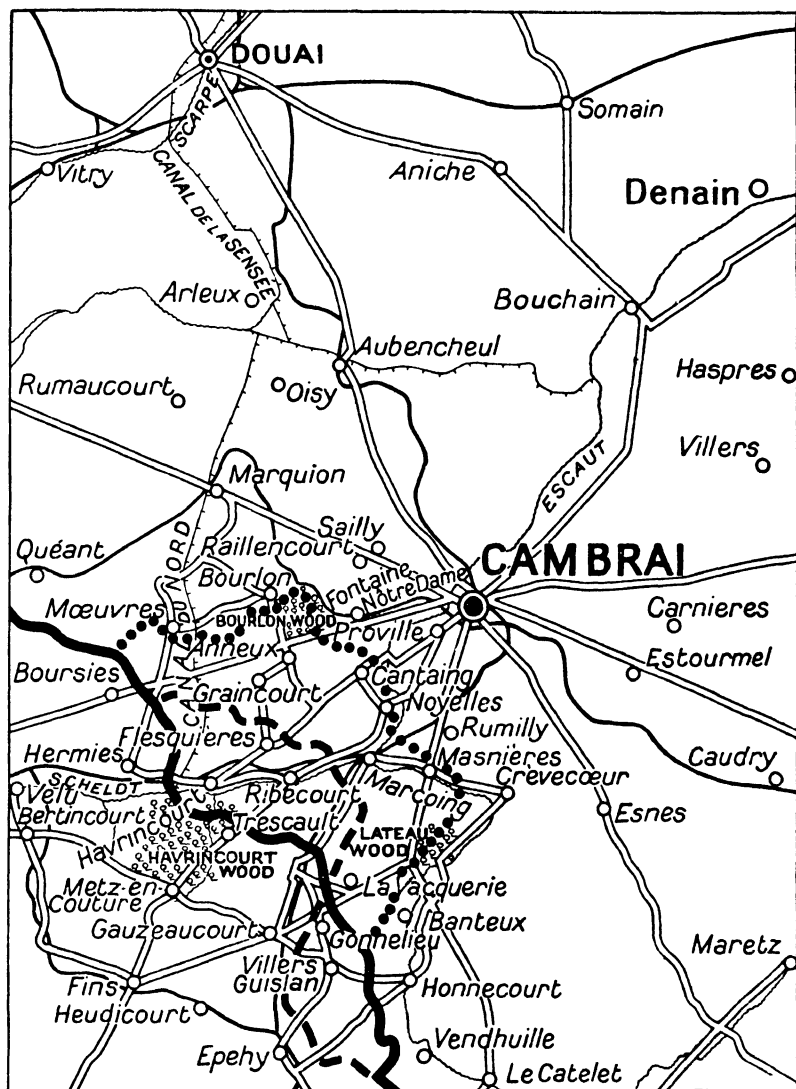
The chief incident of note at this time was the complications caused in the field of international law through the action taken by the Germans against 2nd Lieuts. E. Scholtz and H. C. Wookey of No. 11 Squadron. They were shot down on the 17th October, and pamphlets urging German soldiers to desert were found in their Bristol aircraft. After trial by a German court martial they were sentenced each to ten years' penal servitude. The protests of His Majesty's Government remained unheeded but a threat of reprisals caused the release of the two officers from prison. Though the British Government persisted in maintaining that the dropping of such pamphlets was entirely in accordance with international law, yet the trial of Scholtz and Wookey caused the Chief of the General Staff to rule that in future no propaganda literature should be released from aeroplanes but only from balloons. The fact of the matter was that no protest against this practice was made by the enemy until the autumn of 1917 when this type of propaganda shewed signs of being effective. Whether or not such a practice was contrary to the rules of war enters into that large category of questions of a purely academic nature when fighting the Germans is concerned. In this, as in numerous other

LEAFLET WARFARE

instances, they accept or reject such rules purely in accordance with the dictates of the military situation at the time. Precepts of law mean nothing. They are but abstract conceptions to be obeyed or disobeyed at will. In this matter there is not the least doubt that the dropping of propaganda from the air was entirely legitimate. It remained so and a generation later the same opponents were to make use of it freely.

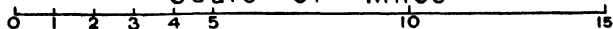
11. Defensive Offensive: France 1917-1918

AT eleven o'clock on the night of the 19th November 1917 the German commander of Jagdstaffel No. 5, stationed at Estourmel, south-east of Cambrai, was aroused by the telephone and informed that the British were to deliver an attack in force at dawn the next day on the front immediately west of Cambrai. His Staffel, the only fighters in the area, were told to stand by from 7 a.m. onwards. The German officer was disturbed in body rather than in mind. The High Command had of late been prodigal in such warnings but they had come to nothing. Moreover, the weather, from the flying point of view, was atrocious and his aircraft had been kept on the ground for a fortnight by a never-ending mist. He turned over and went to sleep again. A few hours later the crash of artillery conspired with the continuous ringing of the telephone to awaken him a second time. On picking up the receiver he was informed that British aircraft and tanks were abroad in great strength, thrusting across the front. While he was digesting this news the telephone rang yet again; it was the Chief of Staff of the Army Corps on the line. 'Why are you not flying?' he demanded. The commander of the Staffel looked out of the window. The usual haze and thin drizzle obscured the airfield. 'I endeavoured to explain', he records, 'that at the moment it was impossible to reach the front; immediately after the start we would get into dense fog; the pilots would get lost.' The Chief of Staff was unconvinced and ordered the Staffel into the air, threatening a court martial if his instructions were not immediately obeyed. The pilots climbed into their waiting machines but dared not take off in the mist, until anti-aircraft fire warned them of the approach of the R.F.C. Two of them did then leave the ground and soon encountered three British Camels of No. 3 Squadron, one of which they shot down while the others dropped their bombs and then crashed into trees. 'Not without justice', wrote a German witness, 'did the chaplain express an enemy's admiration for the dead fliers.' They were part of the force detailed to co-operate with British infantry and tanks in an attack carried out on entirely novel and unorthodox lines. From Gonnelleu to Havrincourt, a distance of six miles, the enemy's defences were to be shattered between dawn and dusk and the cavalry put through to raid German lines of communication. Success depended on secrecy; the enemy was to be caught by surprise and the British infantry's path through his formidable defences was to be hewn not by a heavy preliminary bombardment but by the new weapon, tanks, used in large numbers for the first time in history.



BRITISH LINE 19. NOVEMBER, 1917. —
 BRITISH LINE 29. NOVEMBER, 1917.
 BRITISH LINE 7 DECEMBER, 1917. - - -

Scale of Miles



THE BATTLE OF CAMBRAI 1917

The squadrons of the III Brigade attached to the Third Army gave air support; they had been specially reinforced and a total of 289 aircraft, of which 134 were single-seater fighters, were mustered. Against them the enemy could put no more than 78, including the 12 fighters commanded by the unlucky German officer. The R.F.C. were to begin their assault forty-five minutes after that delivered by the infantry, and their targets were troops, transport, and gun positions wherever they could be found. The plans for the operation had been carefully laid and included a feint attack to be carried out by aircraft on an extended front from Fontaine-les-Croisilles to Bullecourt.

At first all went well. In the half light of the misty dawn of the 20th November a great line of tanks, closely followed by infantry with the R.F.C. a few yards above their heads, surged forward, and breaking through the belts of wire, nowhere less than fifty yards wide, overwhelmed the outer and inner defences of the famous Hindenburg line. Captain A. S. G. Lee, of No. 46 Squadron, flying a Camel, was early on the scene, and thus described it. 'One retains', he wrote, 'vivid pictures of little groups of infantry behind each tank trudging forward with cigarettes alight, of flames leaping from disabled tanks with small, helpless groups of infantry standing around, of the ludicrous expressions of amazement on the upturned faces of German troops as we passed a few feet above their trenches.' Our aircraft had to fly very low, not only because of mist and the overhanging clouds but in order to be sure of finding and attacking their objectives. A number of pilots, who took this risk, flew into the ground. By 10.30 the infantry and some cavalry were in open country beyond the zone, scarred with trenches and pocked with shell-holes, in which both sides had fought for so long. Lateau Wood gave considerable trouble but the real check came at the village of Flesquières which had been by-passed but held out all that day and far into the night. The failure to capture Flesquières and, more important still, to occupy the vital Bourslon ridge to the north of it, was ultimately to prove our undoing. Flesquières was attacked by No. 4 Squadron, and its 25-lb. bombs did considerable damage among the German gunners posted in that village; but apart from this one assault, the R.F.C. appears to have neglected this strong-point throughout the rest of the day.

Undoubtedly the failure to appreciate from the air the importance of Flesquières had a serious effect on the battle. Moreover, a pilot who had flown low over the village at 10.15 and seen troops moving eastwards had reported them to be our own and this led the British Command to believe that the village was taken. It was not until noon that the cavalry, which had been ordered through a position, still held with great tenacity by the enemy, discovered

ATTACKING BOURLON WOOD

the true facts. In excuse of the R.F.C. it may justly be urged that the fighter pilots of those days were seldom qualified 'to appreciate the tactical flow of a battle'. In the mist and smoke of a wide and hard-fought engagement it was hard to discover the exact position of affairs and to grasp the full significance of every detail when moving at ninety miles an hour in a machine which was the target for every form of fire the enemy could bring to bear.

The pilots of Nos. 3 and 46 and of other fighter squadrons maintained until dusk a shuttle service of bombs and machine-gun fire, returning time and again to base to reload and then flying off again into the mist on their task of harassing the enemy. Many bombing attacks on objectives farther back were also attempted, but most of these were foiled by the bad visibility. The casualties that day among low-flying aircraft were high, amounting to thirty-five per cent, and indeed the average was never less than thirty per cent, whenever low-flying attacks were delivered. So ended the first day of the battle.

At dawn on the next, one problem no longer existed, for Flesquières was found to be empty. The general advance continued; Cantaing was captured, and later in the afternoon the important village of Fontaine-Notre-Dame fell. The most important position of all, however, Bourslon Wood itself, which the Germans had transformed into a nest of machine-guns, still held out. When moving against it the infantry were subjected to many attacks from German low-flying aircraft, for the enemy had been quick to imitate the tactics of the R.F.C. and neither the wood nor the ridge it crowned was captured. By that evening Haig was faced with a difficult decision. The situation, so brilliant twenty-four hours before, had deteriorated. His plans for the battle had been based on the correct assumption that it would take the German High Command forty-eight hours to reinforce the Cambrai sector. Of these, more than half had now elapsed and during them the British attack had achieved a success far greater than any which had been won since the beginning of the war. Should the British Commander-in-Chief remain content with his present gains or should he use the few hours which remained to press forward, capture Bourslon Wood and Ridge, and thus dominate the German defences south of the Scarpe and Sensée rivers? Haig decided to continue the battle, though by that time he was well aware of the exhaustion of the troops. Their endurance had indeed been put to a severe test; they had marched and fought for many hours and, worst of all, they could expect no relief. The men who might have reinforced them and carried the struggle to a conclusion so successful that the whole German position in the West might well have been imperilled with incalculable consequences, were for the most part mouldering in shallow graves in Flanders or lying,

FATE TAKES A HAND

wounded and maimed, in British and French hospitals. It was at that moment, when decisive victory was possibly within our grasp, that Fate exacted the full payment for the many temptations to which she had been subjected in the disastrous summers of 1916 and 1917.

On the 22nd November all was quiet save for an enemy counter-attack which achieved the recapture of Fontaine-Notre-Dame. The weather was bad but air reconnaissance shewed that the village of Bourlon was held in strength and that German reinforcements were beginning to come down from the north. From dawn onwards relays of aircraft from Nos. 3, 46, and 64 Squadrons and No. 68 (Australian) Squadron attacked the enemy massing in the area of Bourlon Wood. They suffered heavy casualties, mostly from ground fire, but also from fog which caused two aircraft to collide and a third to hit a tree. Next morning Haig launched his attack on Bourlon Wood and the village of Fontaine-Notre-Dame. It was a failure. By then the Germans were using anti-aircraft guns against our tanks with considerable effect, while in the air von Richthofen's Circus, made up of Jagdstaffeln 4, 6, 10, and 11, had arrived from Flanders. They were unable, however, to do more than hinder the R.F.C. pilots, who gave all possible support to the struggling British infantry by means of numerous low-flying attacks. One incident of many may be recorded. In the afternoon Lieutenant A. Griggs, of American parentage, reconnoitred the precarious position on the left of Bourlon Wood reached by the 10th Royal Irish Rifles and from a height of fifty feet engaged their pertinacious foes with frequent bursts of machine-gun fire. The German reaction was vigorous and he was eventually shot down in full view of the battalion he had so gallantly aided. They did not forget his feat of arms, and some years afterwards commemorated his bravery in the obituary columns of *The Times*.

Bombing attacks by day and night were also made on the railroad immediately behind the German front, but the weather made their success doubtful. During the next two days fighting was heavy and the villages of Fontaine-Notre-Dame and Bourlon changed hands more than once. By the evening of the 27th November our situation, though seemingly satisfactory, was in fact precarious. Though some of the vital Bourlon ridge had been captured, not enough of it was in our hands to make the position secure, and air reconnaissance had reported troop movements on a large scale southwards towards Cambrai from Lille, Douai, and Denain. Our troops were in no position to make further attacks without rest and for two days therefore they made no movement, the intention being that they should then attack once more and capture the rest of the ridge. By the evening of the 29th, however,

GERMAN COUNTER-THRUST

it was clear that the enemy had completed his preparations for a counter-attack in force. The multi-coloured aircraft of von Richthofen's Circus were well in evidence and many low-flying German machines began to appear. When the attack was eventually launched on the 30th a considerable degree of tactical surprise was achieved by the enemy, who had succeeded in inducing Haig to believe that his main effort would be directed against the Bourlon sector. Here the British Commander felt confident of success, for he had, he considered, made dispositions which would parry the expected thrust. When it came, however, it was from another direction. The Germans advanced on a line running from Masnières to Vendhuille, both places well south of Bourlon, and before nine in the morning had captured the villages of Gonnellieu, Villers-Guislan, and Gouzeaucourt. Our Third Army was then faced with disaster, but the desperate resistance made by the gallant 29th Division gave time for a counter-attack to be delivered by the Guards who recaptured Gouzeaucourt at hideous cost. The extent of the casualties may be gauged from those suffered by two companies of Welsh Guards. Of the 370 men who began the counter-attack, 248 fell in the first three minutes.

The Germans owed their success in the first place to the element of surprise. The assembly of their troops which took place in the mists of the early morning had passed unobserved, and then, reproducing our own tactics, they had advanced without the advertisement of a preliminary bombardment. Two R.F.C. aircraft were over them during this time but the mist prevented the pilots from spotting the concentration. Then, too, the German infantry was supported by low-flying aircraft which, according to the Court of Inquiry held in January 1918, with the object of discovering why the German counter-attack had been so successful, 'came over in considerable numbers . . . and flew at altitudes . . . lower than a hundred feet firing their machine-guns into our infantry. . . . The moral effect of this was very great . . . our men did not seem to know what to do . . . witnesses stated that fire on them [the enemy aircraft] produced no results.' For once the biter had himself been bitten, and though the R.F.C. engaged these low-flying machines, they were unable to drive them away, for, said the report of a Divisional Commander, they 'were handled with considerable skill and daring, and the effect of the aerial fire on troops already heavily engaged was very harassing'.

Several more days of heavy fighting ensued and by the 7th December the British line had been withdrawn from the Bourlon to the Flesquières ridge. The battle was over. Lack of reserves, bad flying weather, and heavy casualties, had transformed an initial success into something between a set-back and a defeat.

None suffered more than the Royal Flying Corps, among whose pilots the wastage was very high, high enough, in fact, to disorganize to a certain extent the system of offensive patrols. One fact emerged very clearly. The German Air Force had been quick to profit from lessons taught them by the R.F.C. Their development of the low-flying tactics employed by special patrol flights had been swift and effective, and their High Command realized that in such flights it possessed a powerful weapon.

The year 1918, which was to end with the total defeat of the Germans, opened gloomily enough for France and Britain. Hindenburg and Ludendorff would be able to dispose of forty-two infantry divisions, moved from Russia, which was by then out of the war, and bring into action six thousand more guns, one-third of them captured from the Italians whom, in the Four Years War, we had the misfortune to count as allies. The French armies had not yet recovered from the disasters of 1917, while the British had been so weakened in strength by the costly offensives of the two previous years that not only did the British Government refuse to reinforce Haig, it ordered him to reorganize his weakened divisions and place them on a nine instead of a twelve battalion basis. It also yielded to pressure from Clemenceau, who had come into power in 1917, and caused the British Commander-in-Chief against his wishes to take over another twenty-eight miles of front.

Almost before the battle of Cambrai had ended, it had become clear to discerning eyes, and shortly even to the vision of those who did not wish to see, that the enemy was preparing a last overwhelming attack which would bring them 'to the Channel ports, to Paris, and to a dictated peace'. With reluctance, therefore, the Allies turned from the offensive to the defensive, and training in elastic defence, organized on the same principle as that followed by the enemy, was put in hand. This change in tactics, inevitable though it was for the Army, was not adopted by the Royal Flying Corps. A few weeks before he returned to London as Chief of the Air Staff in the newly created Air Ministry, Trenchard issued a memorandum in which he made it clear that the offensive in the air must at all costs be maintained. The first duty of the R.F.C. was to watch for any movement on the part of the enemy and gather all possible information about it. To do so it must never hesitate to cross the hostile lines and, therefore, to be prepared for combat at any moment. Major-General J. M. Salmond, who succeeded Trenchard in command, was of the same opinion and early in February 1918 took measures to strengthen the air support available to the British Fifth Army under General Sir Hubert de la P. Gough on whom he suspected that the blow would fall. On the 24th he expressed his conviction

that the enemy would attack between the Sensée River and St. Quentin, in other words along the front of the Fifth Army, and he was right. The Germans, he maintained, were holding a great part of their air force in reserve, doubtless in order to train it for the forthcoming offensive. His views did not by any means coincide with those of General Headquarters, where even as late as the 8th March it was believed that the main blow would not fall on the Fifth Army.

The main concern of the R.F.C. was to fulfil the order issued by Trenchard just before his departure and confirmed by his successor. Every pilot and observer must find out all he could about the intentions of the enemy. To do so, however, was far from easy, for, as the fateful month of March 1918 wore on, the weather grew worse and worse, and from the 17th to the 20th low clouds and rain obscured the whole area in which it seemed probable that the battle might be fought. Reconnaissance from the air proved out of the question, but a German non-commissioned officer pilot, brought down on the 18th, obligingly informed his captors that the expected attack would be delivered on the 20th or 21st. On the evening of the 20th, in weather which had slightly improved, the R.F.C. was able to detect and report that the German troops in the front line were being relieved, a sure prelude to attack. Our own troops were warned; but the assault, when it did come, achieved tactical surprise owing to the fog and mist which enveloped it. To meet it in the air the R.F.C. had been able to muster in the area of the Third and Fifth British Armies a total of 579 serviceable aircraft of which 261 were single-seater fighters. Against these the enemy could bring 730 of which 326 were fighters. Thus for the first time the Germans had local numerical air superiority on the Western Front. This they had achieved partly as the result of possessing unity of command and partly by tremendous efforts behind the lines in the factories of Germany. The *Flugzeugmeisterei*, a department specially established for the purpose, had been given the task of doubling the number of fighter flights and of producing an additional seventeen artillery flights. Its creation had been due largely to the fear in Germany that America, now that she was in the war, might produce an overwhelming quantity of aircraft, and, to a lesser extent, to the appointment of Churchill as Minister of Munitions in July 1917. 'The choice of such an energetic personality . . . portended an increase in English aircraft.'¹ So hard did the new Department work that by the 1st March it had completed this ambitious programme.

Our air operations before the battle can be summed up in two words—reconnaissance and bombing. The Corps squadrons

¹ *Deutschlands Krieg in der Luft.*

A MEANS TO AN END

flew hundreds of hours to engage batteries and photograph stretches of trenches, wire, strong-points, dumps, and other objects of military importance. This day-to-day work of monotonous danger had in it no spectacular element, but its importance was very great, greater indeed than that of the fighter squadrons. To engage the enemy's air force and shoot down his aircraft was not an end in itself but only a means to an end. They had to be destroyed in order that the Corps squadrons might continue uninterrupted their task of observing the enemy. By March 1918 both sides had fully grasped its importance. The difference between them lay only in the fact that the R.F.C. was successful.

Bombing was carried on by night and day, the night squadrons flying F.E.2Bs, the day D.H.4s. The objectives were, as usual, railways, ammunition dumps, enemy airfields, and enemy billets. Attacks on the last of these targets had been found to give good results, for the bombing of infantry at rest in back areas damped their ardour.

The fighters were also preparing. There was considerable controversy among the commanders of these squadrons on the optimum size of a flight. Some thought six aircraft, the figure suggested in a Royal Flying Corps memorandum of December 1917, to be too many for the control of one flight commander. Many urged that three was the ideal maximum. It was eventually left to the brigade commanders to organize their patrols as they thought best, with the result that most squadrons worked on a basis of three sub-formations each of five aircraft. At long last the commander of a fighting squadron had his chance. Up till then he had had to be content with commanding his squadron from the ground, for his duties had been mostly administrative; now with the new formations and the increase in the establishment of fighting squadrons to twenty-four aircraft, he could, and did, go out to war.

Air fighting developed before the attack on the ground, offensive patrols being flown for several days beforehand. This led to a number of brisk engagements, notably with Manfred von Richthofen and his famous Circus. His head wound, sustained in July of the previous year, had kept him from the front for a very short time only, but it is said that he was never afterwards quite the man he had been. This did not, however, prevent him from taking the air at the head of a mixed collection of Fokker triplanes and Albatros Scouts. On the 12th he and his men accounted for four out of nine Bristol fighters of No. 62 Squadron. On the next day it had its revenge when in a general dog fight Lothar von Richthofen, his brother, was shot down and badly injured.

So things continued until, as has been said, on the eve of the

21 March 1918

THE GERMAN ONSLAUGHT BEGINS

battle, fog and mist descended and made flying almost impossible. As soon as it was known for certain that the attack was coming, the commander of the V Brigade of the Royal Flying Corps issued general instructions defining the duties of the Corps and Army squadrons. The first were to continue their indispensable work of gun-spotting and photography; the second were, first and foremost, to prevent the Corps squadrons from being attacked and then themselves to attack. For their guidance a list of likely objectives was drawn up. Of these the places where German soldiers left trains or buses were obvious vital and vulnerable spots, as also were troops on the move or in the front line. The Camels were to protect the Corps machines, the Bristol fighters to undertake low-flying attacks, while the S.E.5s were to patrol the whole area and do battle with enemy air formations.

Eager to obey these orders though they were, when the 21st March dawned the pilots found that it was physically impossible to put them into effect. The German attack, launched at 4.45 a.m. in thick mist, penetrated the elaborate defences of the Forward Zone and reached the Fifth Army's Battle Zone before noon. It was made in the greatest possible strength; massed against our Fifth Army and part of our Third were fifty-six divisions, with twelve more in immediate reserve. Against these the Fifth Army mustered eleven divisions with three infantry and three cavalry divisions in immediate support, while the Third Army had four divisions with three in reserve.

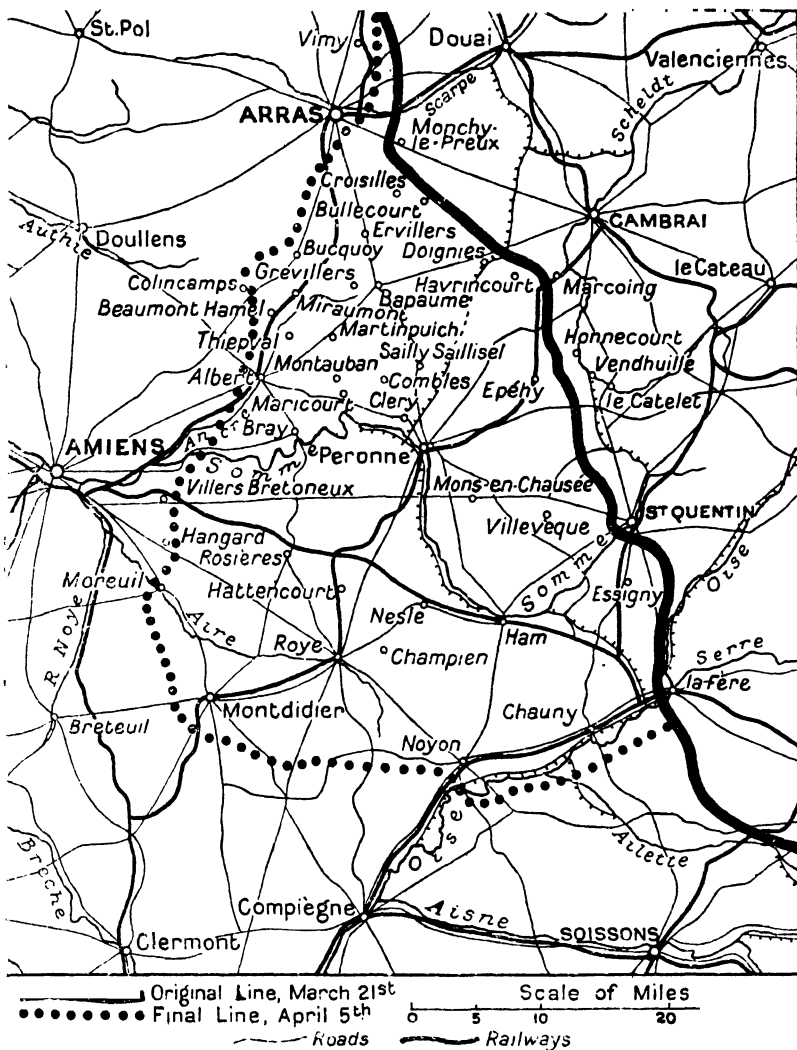
For several vital hours both those in the forward positions and those at Brigade, Division, Corps, and even Army Headquarters had no accurate knowledge of what was happening. The short preliminary barrage had cut telephone lines; the light signals sent up by the defending troops were not seen in the fog, and Gough had no authentic information upon which he could form his judgement and make his dispositions. The commander of the Third Army on his left was slightly more fortunate, for a pilot and observer of No. 59 Squadron were able to see something of the battle for an hour in the morning until the R.E.8 in which they were flying was hit by a shell.

The mist, which so nearly proved fatal to our cause, lifted a little before noon, and for about three hours a stream of wireless messages came down from the air indicating a profusion of targets which ranged from large bodies of German infantry, massed in sunken roads or streaming onwards, to German batteries coming into action or limbering up to move forward. By 3.50 p.m. Captain D. H. Oliver and 2nd Lieut. W. H. Leighton reported that a deep bulge had been made by the enemy in the lines of the Third Army between Bullecourt and Doignies. On its right the

FAILURE OF AIR-GROUND COMMUNICATION

gallant Fifth Army was in even more desperate case. The weather there was worse even than it was to the northward and pilots flew all day in shifting veils of fog and mist which would drift aside for a few brief moments to reveal dense masses of the enemy pressing forward from St. Quentin. They were covered by many German contact patrol machines, and much confused and intense air fighting ensued. The Army squadrons co-operating with the Fifth Army attacked whenever and wherever they could, but the enemy was in such strength that it was impossible to give complete protection to the Corps squadrons, which continued to do their utmost to provide our already disorganized batteries with targets. So swift was the German advance that in certain places our forward aerodromes came under fire. No. 5 (Naval) Squadron, for example, was shelled out of Mons-en-Chausée. The last message received by its commander, immediately before his office was demolished by a shell, was a memorandum from the General Staff containing elaborate instructions on the growing of vegetables, and ordering the preparation of suitable frames for the planting of seedlings. Whether this is an instance of a ruling passion strong in death or of hope springing eternal will in all probability never be known.

The reasons why the Corps squadrons on that and on succeeding days had so little success was very simple. In the storm and stress of battle, the organization for securing a full and effective measure of co-operation between the pilots in the air and the gun crews at the battery sites broke down. When the battle and the war were over this deficiency provided much food for the argument of many and the thought of few. For weeks, months, indeed years, the sterile wind of controversy whined down Whitehall and through the Service Clubs. The Royal Flying Corps, it was said, had let slip a wonderful opportunity; well-directed artillery fire might so have disconcerted the enemy as to have thrown his attack into confusion or even halted it. The critics, both civilian and Service, forgot, or did not choose to remember, one vital factor. Communication from the air to the ground was maintained by wireless and to receive messages it was necessary to erect an aerial. This was what the artillery only too often failed to do. It is not fair to blame them, any more than it is fair to blame the R.F.C. Batteries had to shift their positions, very often several times a day, and sometimes several times an hour. In such circumstances they could not, or at least did not, erect their wireless masts. Even when, in rare instances, they did so, the battery commander, more often than not, not only did not know the zone calls but was also ignorant of the zone which the battery was supposed to cover. One instance will suffice to make this dreadful situation clear. On the night of 21st-22nd March, T. Leigh-Mallory, the officer commanding No. 8 Squadron, sent his wireless



THE GERMAN OFFENSIVE 1918

R.F.C.'S HARASSING TACTICS

officer to do all that he could with such spare equipment as was available to help the wireless operators attached to the batteries of artillery with which he was trying to co-operate. The officer made a tour of them and found not one mast erected or in action. In the haste and confusion of the retreat, most of the batteries had abandoned their wireless equipment. 'As soon as the retreat had started,' runs his report, 'all idea of co-operating with aeroplanes seems to have been abandoned.'

Measures other than artillery fire had to be taken to stem the German onset. What they were will be seen in a moment. While on that first day the fog-blinded infantry and guns were engaged in a desperate fight against enormous odds, and while the Corps and Army squadrons were in the thick of a confused struggle above their heads, D.H.4s of Nos. 25 and 27 Squadrons and No. 5 (Naval) Squadron did their best to fulfil the bombing programme. Here again the weather neutralized their efforts. Moreover, since they had never been countermanded, the De Havilland pilots were still under the necessity of obeying orders issued in the previous August not to bomb from lower than fifteen thousand feet, from which height it was impossible to hit a small target such as the very important bridges at Honnecourt, Vendhuile, and Le Catelet behind the German lines; and it was over these that enemy troops were pouring forward in seemingly unending strength. When originally issued, the object of such orders had been to prevent wastage, for at that time D.H.4s had been very scarce. Now the orders were obsolete and were cancelled within a few days of the opening of the battle.

Though the long-range bombing was unsuccessful, considerable execution was done by the low-flying attacks of Nos. 84 and 24 Squadrons flying S.E.5s, and No. 23 Squadron flying Spads. Their 25-lb. bombs caused, to quote the regimental history of the Second Bavarian Regiment, 'considerable losses. . . . The Signal officer, the excellent Weisz, was killed instantaneously. The regimental staff was decimated.' Similar details are found in the histories of other German regiments which took part in that day's attack.

Such tactics could harass, but not break up, the onslaught. By nightfall on the 21st, the Fifth Army was in full retreat. The squadrons of the R.F.C. moved with them but saw very little action the next day, for the fog was thicker than ever. A report received in the middle of the afternoon enabled a counter-attack to be organized against the village of Vraucourt, and its success was described three hours later by an observer back from contact patrol. The respite gained was, however, but momentary, and all that day the enemy made formidable progress, especially against the Fifth Army, which by nightfall had been driven back as far as

Bonaly on the Cologne and Villéreque on the Omignon, both tributaries of the Somme. Gough had by then been compelled to throw in his last reserves, but, though they fought with the greatest gallantry, they could effect little. The enemy's strength was seemingly overwhelming.

The next day told the same story, and though the IV and VI Corps of the Third Army on the left held firm, the Fifth Army was compelled to retreat still farther to the Somme itself. That day, low-flying attacks by the R.F.C. over the Forward Battle Zone were extended, while German transport and infantry were bombed and machine-gunned in the back areas. The weather was more kindly and activities in the air were therefore more intense. Observers had, for once, a clear view of the battle. '2.40 p.m. Many infantry seen advancing west of Mons-en-Chausée. Dropped four 25-lb. bombs on them, causing many casualties and scattering them. . . .' 'Dropped message sending S O S to field batteries on large mass of enemy infantry advancing north-east of Athies. . . .' 'Large swarms of enemy troops were then observed advancing across fields towards Viefville.' These are but three of the entries in the logs recording that day's fighting. Many actions developed in the air, and altogether thirty-six German aircraft were brought down on the battle-field, among the German pilots to lose their lives being the son of the German Commander-in-Chief, Ludendorff.

When Sunday, the 24th March, dawned, the situation was soon seen to be critical if not desperate. The enemy had driven on between the Third and Fifth Armies and an R.F.C. report received at 8 a.m. shewed that the Germans were in Sailly-Saillisel; not long afterwards another announced them in Cléry. In the afternoon Combles fell, and soon fierce efforts were being made to hold a line as far back as Maricourt and Bray. As on the three previous days, low-flying attacks were kept up by the squadrons detailed for the purpose. Again the records of German regiments shed an interesting light on their effect. 'British aeroplanes . . . continuing their dive to within between two to three metres of the ground, attacked us with their machine-guns,' says a bugler of the Eighth Grenadier Regiment. 'Several "Tommies" flew so low that the wheels of their aeroplanes touched the ground. My company commander, Lieutenant Nocke, had to fling himself flat on the ground, but for all that he was struck on the back by the wheels of one machine, thus being literally run over.' Air fighting, too, was severe, and one pilot, Captain J. L. Trollope, flying a Camel of No. 43 Squadron, shot down six Germans between dawn and dusk.

The crisis of the battle came the next day, the 25th. By seven-thirty in the morning an observer of No. 59 Squadron reported

FIFTH ARMY IN DIRE STRAITS

very large concentrations of German infantry just east of Bapaume, but, for reasons already explained, his frequent calls for artillery fire remained unanswered. By now part of the area covered by the right of the British Fifth Army had been taken over by the French Third Army, which at once became involved in the struggle. It was pressed back, and by that afternoon all the Allied line was crumbling. The Germans were sweeping on in the north through Ervillers, in the centre to the outskirts of Thiépval and Montauban down to the Somme at Ham and in the south towards Hattencourt, Champien, and Noyon.

The situation was now as grave as it could be, and it was then that Salmond, after consulting Trenchard in London by telephone, sent an order to the Commander of the 9th Wing which caused the R.F.C., at the price of heavy casualties, to play a vital part, not only in detecting and reporting the whereabouts of the enemy, which it cannot be too often emphasized was one of its most important duties throughout the Four Years War, but also in the actual repulse of his assaults. 'I wish you,' said Salmond, 'as soon as you can after receipt of this, to send out your Scout squadrons . . . on to the line Grevilliers-Martinpuich-Maricourt. These squadrons will bomb and shoot up everything they can see on the enemy's side of the line. Very low flying is essential. All risks to be taken. Urgent.'

Nobly and promptly was this order obeyed. Camels, S.E.5s, Bristol Fighters, R.E.8s, D.H.4s, and Sopwith Dolphins rushed into the fray, their pilots dropping their bombs and firing their ammunition into every target which presented itself, and they were very numerous. They then went back to reload and return once more to repeat the process. The enemy was shaken, and it was small wonder that the German 248th Reserve Regiment records that 'the strong activity of the [hostile] airmen was most unpleasant', while the 52nd Reserve Regiment reported them to be in great strength. 'We count more than thirty above us at the same time.' In truth the pilots of the Flying Corps gave the enemy no respite, and their eagerness was such that Salmond could that night report to Trenchard: 'I had news from the I Brigade that our machines were so thick over this point that there was every danger of collision in the air.' At one time a hundred aircraft had been concentrated above the threatened flank of the Third Army.

During the night, bombers of Nos. 101, 102, and 83 Squadrons took up the task, flying through storms of hail and snow to bomb Péronne, Bapaume, and other places. When the next day drew to its close, the crisis, which had caused this order to be issued, was over in so far as the Third Army was concerned; but the unhappy Fifth, now ordered to hold the approaches to Amiens, was in

FOCH ORDERS AIR CONCENTRATION

dire straits. Its only reserves consisted of some 2,200 men commanded by an officer of field artillery on his way back from leave to join his command, and were made up of mixed elements—stragglers, the staffs of army schools, engineers, and American railway-workers. The three Corps and five fighter squadrons of the R.F.C., co-operating with the Fifth Army, carried out orders similar to those issued to their comrades to the north. One thing they accomplished, the driving from the air of most of the German Air Force that day. 'There are many British but no German flying-men up', is a querulous sentence in the history of the German Second Foot-Guards, and it correctly sums up the situation.

That same day, a decision momentous in its consequences was taken by the British and French Governments. On the 24th March Haig had asked Pétain, the French Commander-in-Chief, to put a large force astride the Somme at Amiens in order to cover that city, which, despite the desperate resistance of Gough's Fifth Army, was in the gravest peril. Pétain's reply was to undertake to reinforce the local commander, General Fayolle, but at the same time to instruct him to fall back, if necessary, to cover Paris. In other words, should German pressure continue—and there was no sign of it slackening—the French and British armies would, by Pétain's decision, become separated and Ludendorff gain that decision upon which he had staked all. The issues, then, facing the conference which met at Doullens on the 26th were neither more nor less than victory or defeat. Fortunately for Britain, Europe, and the world in general, the French Government representatives in 1918—they were Poincaré and Clemenceau—were made of sterner stuff than were Lebrun and Reynaud in 1940, nor was Lord Milner an unworthy forerunner of Winston Churchill. At noon the mutual distaste of England and France for unity of command was overcome, and Ferdinand Foch appointed 'to co-ordinate the action of all Allied armies on the Western Front', a vague phrase which, in fact, gave him the direction and control of a battle already to all appearance lost.

With Foch's actions on the ground we are not concerned. Those which he took in the air were positive enough. Within a week he had issued orders to the British and French Air Forces which shewed clearly his strategic grasp of the situation. There were no boundaries in the air, and the nationality of the pilot flying the aircraft sent to bomb the communications of the enemy mattered to him not at all. 'The essential condition of success,' he laid down, 'is the concentration of every resource of the British and French bombing formations on such few of the most important of the enemy's railway junctions as it may be possible to put out of action with certainty, and to keep out of action.' With

BOMBING INTENSIFIED

regard to air fighting, he was equally definite. 'The first duty of fighting aeroplanes,' he said, 'is to assist the troops on the ground by incessant attacking with bombs and machine-guns on columns, concentrations, or bivouacs. Air fighting is not to be sought except as far as is necessary for the fulfilment of this duty.'

Foch had put his finger on the supreme weakness of the Allies, not only on the ground but in the air. Lack of concentration, which alone makes an overwhelming effort possible, had been a noted and dismal feature of the whole war. There was no strategic unity either on land or in the air, and it was the absence of this essential which was one of the main reasons why the Germans approached so near to victory. On land the Marshal achieved it. In the air he was not so successful. Yet the case for unity was overwhelming. On the 1st April, the day on which Foch issued his instructions, 822 German aircraft faced 645 British on the battle-front south of Arras. In other words, the enemy, and not ourselves, enjoyed numerical superiority. North of Arras, however, 393 British machines were opposing but 185 German. The position in regard to the French Army was even more remarkable. On that day a total of 2,000 French aircraft were confronted by no more than 367 German. Thus, although from the Channel to the Swiss border the Allies outnumbered the Germans in aircraft by nearly three to one, yet at the actual battle-front, which was the only place that mattered, the enemy possessed a local superiority of nearly 30 per cent. Only a unification of air control, similar to that which had been effected on land, could have wholly remedied this situation which, had it not been tragic, would have been absurd. As it was, gallant men died facing unnecessary odds because the political difficulties attending a factual, as opposed to a theoretical, union of the Allies, were too great.

On the night of the 26th-27th March our bombing was intensified to the maximum degree possible. Two flights of No. 58 Squadron made twenty-five journeys between darkness and dawn, flying a total of fifty hours, a record which stood until the end of the war. They bombed the roads leading from Bapaume and Péronne to Albert, while No. 102 Squadron attacked neighbouring villages, and No. 101 Cambrai. On this Sunday, in pursuance of an order which expressed the hope 'that a record number of bombs will be dropped', the squadron was continually in action for seven hours and 502 25-lb. bombs were dropped on Ham and Cambrai. The successes scored included two hits on a train, another on a canal bridge, and another on a column of transport. The two naval squadrons based on Dunkirk also took a hand, attacking among other objectives the junctions of Lens, Lille, Tournai, and Valenciennes.

Throughout the 27th March the Third Army stood firm, and

'AN ACT OF GALLANT SKILL'

the low-flying attacks of the aircraft supporting them were carried on with increasing intensity. It was on this day that one of the finest deeds of the war was performed. 2nd Lieut. A. A. McLeod, a Canadian of No. 2 Squadron, with his observer, Lieut. A. W. Hammond, M.C., was attacked by eight enemy aeroplanes belonging almost certainly to von Richthofen's Circus. In the ensuing fight, three of the enemy were shot down, but by this time McLeod had been wounded in five places, and his machine, an Armstrong-Whitworth, set on fire. The situation appeared desperate, but despite his wounds, McLeod climbed over the port side of the cockpit and, standing on the lower wing, continued to manœuvre the machine, and 'by side-slipping suitably, kept the flames on one side, thus enabling the observer to continue firing until the ground was reached'. The landing was made in no-man's-land, and under heavy machine-gun fire McLeod dragged to cover Hammond, who had received one more wound than he. He then collapsed from loss of blood, and some months later died of his wounds after receiving the Victoria Cross for an act of gallant skill which may have been equalled but has never been surpassed.

That night, despite stormy weather, our bombers dropped 840 bombs on the enemy, and fired 18,000 rounds of ammunition. Results were reasonably good, but they were not enough to prevent the enemy from widening his attack on the next day by a series of assaults on Arras. On this occasion, however, he had no fog to help him. The attacks were seen from the air in time and broken up. Since the conditions were favourable, our defences proved adequate and the Germans made no progress. Farther south, the Fifth Army was still being subjected to a heavy battering. 'It was on this day,' runs a report of No. 52 Squadron, 'that an extraordinary number of enemy troops were reported, and our machines had a field-day attacking columns in fours. Heavy casualties were inflicted on several enemy battalions.'

By now the Fifth Army was in a state of utter weariness. It had fought for a week in circumstances of peculiar difficulty, and its exhaustion was extreme. Yet it still did not give way, not even when the Government relieved Sir Hubert Gough and his Staff of their duties. History has yet to pronounce a final verdict on this gesture, but, as more and more evidence accumulates, it is becoming increasingly obvious that 'it was worse than a crime, it was a blunder'. The gallantry and skill of the officers and men of the Fifth Army have long been obscured by the fate which overtook their commander in the height and stress of the conflict. With the rights and wrongs of this decision, which will always bear the marks of haste and panic, this narrative is not concerned. It must suffice to say that observers in the air had nothing but

intense admiration for the conduct of those weary men, locked in battle against enormous odds in the dreary wilderness of the Somme valley. If the testimony of those who watched them in action throughout those fire-fringed days is any guide, then from the general at their head to the humblest company cook who exchanged a dixie for a rifle, they are deserving of the highest praise this nation can bestow.

The absorption of the Fifth Army into the Fourth under Rawlinson did not mean the end of the battle. There was heavy fighting on the 29th and again on the 30th, when our low-flying aircraft redoubled their efforts with admirable results. With every day that passed, German strength in the air grew weaker and weaker. On the last day of March, for example, many of our pilots found next to no opposition, and only three combats were fought. Yet our casualties continued to be heavy, and in one day ten aircraft could be reported missing and thirty-eight wrecked, a high proportion of them through bad landings. This in itself was an indication of the strain under which the pilots were labouring; but they did not relax, for their duty was not done until the battle was over. In the two months of March and April 1918, our losses were 1,032 aircraft out of a total at the beginning of the battle of 1,232 in France. Of these, 528 were fighters.

But to quote figures is to anticipate. When the battle was at its height a decision was taken which was to have a profound effect on the course of the war in general and which was to alter the fortunes of the R.F.C. and the R.N.A.S. in particular.

On the 1st April 1918 the Royal Air Force was formed. Before the events which led up to this achievement are described, what happened in the torrid air above Africa and Palestine, above Arabia and Mesopotamia, and in the cloud-swept skies of England must first be recorded.

12. The Desert Air

Middle East 1914-1917

ON the 27th November 1914 a Maurice Farman Pusher aeroplane took off from the newly constructed airfield of Ismailia and flew eastwards on a reconnaissance flight over as much of the Suez Canal defence zone as its limited powers of endurance enabled it to cover. By then we had been at war with Turkey for three weeks, and already it seemed probable that the enemy was making preparations to attack the all-important canal. His plan, though this was not known at the time to Lieut.-General Sir John G. Maxwell, commanding our forces, was to obtain control over a portion of the canal for a period long enough to allow block ships to be sunk in it. Assisting the R.F.C. Farman, were seaplanes manned by a mixed crew of French and British airmen, and on the 17th-18th January units of both sections of this small air force discovered the movements of the enemy. The Turks were moving down from Palestine into Egypt, not along the historic coast road which was under the guns of Allied war-ships, but daringly across the desert, rendered more passable than usual by exceptionally heavy winter rains. On the 23rd January 1915 their main column was discovered from the air to be at Moiya Harab, some twenty miles north-east of Suez. Two days later two more columns were seen, one to the north and the other to the south. Thus once again, in a part of the world very different from Flanders and the Aisne, was the Royal Flying Corps fulfilling the first and most important duty assigned to it at that time. Due warning was given to the small British force, and, when the attack was delivered in the early hours of the 3rd February, it was decisively repulsed, on the next day the enemy being reported from the air to be in full retreat.

So ended the first clash on land between the British and Turkish armies. The campaign in Gallipoli and the part played in it by the R.F.C. and the R.N.A.S. have been described in a previous chapter. It is now necessary to pass in review the air operations carried out by pilots flying in the hot, thirsty lands of Africa, Palestine, and Arabia, from many-gardened Damascus in the north to the oasis of El Fasher in the south, from Ctesiphon in the east to Sollum in the west. The minor operations against Sayed Ahmed, the Grand Senussi, and Ali Dinar, Sultan of Darfur, may be briefly told.

Sayed Ahmed was the first of these two potentates to try conclusions with the British. A series of raids carried out by his followers on our posts in the Western Desert and on the coast caused us to

declare war against him on the 26th November 1915. The small British forces in that huge area were concentrated at Mersa Matruh on the Mediterranean, a name destined, a generation later, to become famous. With them was a detachment from 'A' flight of No. 14 Squadron, consisting of two B.E.2c aeroplanes, which carried out a number of very useful reconnaissances from the 5th until the 22nd December. On that day one of the observers returned with careful sketches of the exact position of the Senussi, who were concentrated in the Wadi Majid, within gun range of the coast. On Christmas Day the Western Frontier Force moved out against them, supported by the sloop *Clematis*, which, with the aid of air observation, shelled the enemy at a range of ten thousand yards. The Senussi fled, leaving a considerable number of dead and many stores. A delay, however, in the enveloping movement of the British cavalry column prevented this small combined operation from being completely successful. The main body escaped but were shortly afterwards discovered farther inland, and on the 19th January their camp was seen at Halazin and sketched from the air. It was composed of more than three hundred tents, and included one of magnificent proportions which housed the Grand Senussi himself. Issuing from Matruh, the British column attacked the camp, but once again the main body escaped, this time to Agagiya, not far from Sidi Barrani, a squalid little town, also to be known to fame in the next war. Here once more they were discovered by the indefatigable B.E.2cs, attacked and heavily defeated. Their commander, Jafar Pasha, an Arab serving more or less compulsorily with the Turks, was captured, and subsequently proved a sharp thorn in the side of his former masters, for he became one of the leaders of the Arab revolt. On 29th October 1936 he was murdered outside Baghdad by an emissary of the upstart General Bakir Sidqi.

After the occupation of Sollum on the 14th March the campaign was virtually over. Discouraged by his defeats, Sayed Ahmed had moved inland and abandoned the Kharga oasis which had been under frequent reconnaissance from a detachment of No. 17 Squadron based on Asyut. Some of these flights involved traversing 225 miles of arid and utterly inhospitable country. Apart from their intrinsic value they showed that aeroplanes could be used when all other methods of discovering the whereabouts and intentions of the enemy were impossible. On its abandonment by the Senussi, the air detachment moved to Kharga and continued their work of watching the enemy. The hazards of their daily task are grimly illustrated by what happened to 2nd Lieutenant S. G. Ridley and his observer, First Air Mechanic J. Garside, on the 15th June 1916. Flying in a B.E.2c, they set off to an advanced landing-ground forty miles away, from which



THE RED SEA AND THE NEAR EAST

HAZARDS OF DESERT FLYING

they were to reconnoitre Dakhla oasis the next morning. They lost their way, made a landing in the desert, and settled down for the night in company with the crew of a second B.E.2c on the same mission. In the morning their engine would not start, and the others set off for help. On their return, Ridley and Garside's machine was no longer to be found. A three-days' search eventually discovered it in the waterless desert. The pilot and the observer were dead, victims of the raging desert sun. Garside had kept a diary, from which it was apparent that they had twice succeeded in taking off before their engine finally gave out.

It was not until February 1917 that the Sayed Ahmed suffered a final defeat before his capital in the oasis of Siwa. He eluded death or capture and eventually reached Constantinople in an Austrian submarine while his cousin and successor hastened to conclude a treaty with the British.

Far to the south the ruler of the torrid sultanate of Darfur was also eager to attack us. In 1899 Ali Dinar had abandoned the Khalifa a few days before the battle of Omdurman and had set himself up as an independent ruler of territories which marched with the Sudan. Now, seventeen years later, repenting of his prudence or cowardice, he announced that he would attack with all his forces and drive the British into the sea. Opposing him was Sir Reginald Wingate, Sirdar of the Egyptian Army and Governor of the Sudan, who could muster a force of some two thousand men, Sudanese, Egyptians, and Arabs for the most part, under the command of Lieut.-Colonel P. V. Kelly. Wingate, a man of enterprise and imagination, realized how great would be the effect produced upon Ali Dinar's untutored hordes by the appearance of aircraft. The difficulties of bringing them to the scene of action and then loosing them, veritable bolts from the blue, upon an astounded enemy, were, however, very great. No aircraft at that date, the spring and early summer of 1916, had ever flown in a part of the world where a temperature of 120 degrees in the shade¹ was usual, and where sandstorms rising to heights of two thousand feet or more might at any moment spread a sombre, dusty curtain across the sky. Before they could begin operations the aeroplanes—they belonged to 'C' Flight of No. 17 Squadron stationed at Suez—had to be taken by sea for eight hundred miles, then by rail for another nine hundred, and then by camel for a final three hundred and fifty. The last part of the journey was through a featureless country of scrub, sand, and thorn-trees. It says much for the energy and skill of Major P. R. C. Groves and Captain E. J. Bannatyne, in charge respectively of

¹ It was found that despite the wrapping of petrol tins in grass matting, 50 per cent of their contents evaporated.

'IRON HORSES WHICH FLEW'

the operation and the detached flight, that between the 7th April and the 11th May all difficulties of transport and supply had been overcome and that two of the four aeroplanes were ready at the advanced landing-ground of Jebel el Hilla to take off on the following day for their first reconnaissance flight. Its effect on both friend and foe was great. Kelly's small force was jubilant at this display of British power and magic. 'By God,' his men were heard to exclaim, 'our General is very clever.' The warriors of Ali Dinar were correspondingly depressed, though the Sultan himself affected to despise 'the Sirdar's iron horses which flew in the air.' Once again, as in Sinai and the Western Desert, the aeroplane apprised the troops on the ground of the exact dispositions of the enemy. More than that, they bombed and machine-gunned him with excellent effect. A pitched battle, fought on the 22nd May at Beringiya, achieved the complete defeat of Ali Dinar, and the next day all that were left of his Dervish army, some three thousand, were attacked by 2nd Lieut. J. C. Slessor with bombs and Lewis gun fire. Two of the Sultan's servants and his camel, upon which he was about to mount, were among the slain, and many of the survivors fled in panic, preferring to perish from thirst in the desert rather than return to El Fasher, where they might again be subjected to this terrifying form of warfare. Ali Dinar himself survived for a few months longer as a hunted fugitive. On the 6th November 1916 his camp at Jebel Juba was overrun, and he was found with a bullet through his head. So ended this small and successful campaign, in which the Royal Flying Corps had played a most useful part.

Egypt, always important, became more so after the evacuation of the Gallipoli peninsula. Lieut.-General Sir Archibald J. Murray, leaving the Imperial General Staff of which he had been Chief, set up his headquarters, first at Ismailia, and subsequently at Cairo. His air commander was Lieut.-Colonel W. G. H. Salmond, who at once began to lecture officers of the Army on the methods by which the R.F.C. sought to co-operate with it. The result was wholly admirable, and from the beginning the armies fighting in Palestine and subsequently in Syria understood very well the use of air power in the field. Up to April 1916 no Turkish or German aircraft had appeared to dispute our mastery of the air. But by the middle of that month a number of Rumplers, of higher speed and altogether better performance than the B.E.2cs, and a few Fokker single-seater fighters, began operations in Palestine. In sending such fast and modern aircraft the Germans were fulfilling a principle of war which the War Office were unable or unwilling to follow. Other things being equal, victory inclines to the side with the better weapons. Unlike

ourselves, the enemy did not relegate to distant theatres of war his obsolete or obsolescent material.

In May a period of desultory bombing set in, the R.F.C. and the seaplanes from the *Ben-my-Chree* attacking El Arish, the Germans Port Said and Qantara. One small engagement on land must be mentioned as an example of what may happen when warnings from the air are disbelieved or pass unheeded. During the previous month, as a first step towards the invasion of Palestine, the Army had been engaged in constructing a railway from Qantara towards the Qatiya oasis. By the middle of April this position had been occupied by a small force. On the 22nd an air reconnaissance report showed that the Turks were massing to attack the oasis. So convinced was Salmond of this intention that he went personally to the Commander-in-Chief and expressed the opinion that the enemy was about to move. It does not appear, however, that the officers in command at Qatiya or at the other advanced posts in the neighbourhood were warned, and when the Turkish attack developed, it came as a complete surprise. It was, therefore, successful and three and a half squadrons of Yeomanry were wiped out.

By the middle of 1916 steps were taken to expand the air force considerably in this theatre of war. First, the Middle East Brigade was established, and soon consisted of the 5th Wing, comprising among others an Australian squadron, No. 30 Squadron operating in Mesopotamia and No. 26, a South African squadron, in East Africa. In addition, a Cadet Wing was formed and a large training programme put into operation in a land where, at least in winter, weather conditions were ideal for learning to fly. This brigade was the ancestor of the Middle East Command, which has since then played a conspicuous part both in peace and war in the development of British air power.

During that summer fighting for the approaches to Palestine went on, the Turks in August assaulting Romani, which the railway had reached by June. The battle which was then fought absorbed the whole available strength of the R.F.C., each pilot and observer of the seventeen aircraft available making two or three sorties between dawn and dusk throughout the days of the action. They immediately found themselves engaged with the enemy in the air, and a number of brisk combats took place. On the 11th August, for example, 2nd Lieut. E. W. Edwards of No. 14 Squadron, with seven bullets in him, was seen staggering towards the British lines in the neighbourhood of Bir el Abd, fifteen miles beyond Romani. He was seeking help for his observer, 2nd Lieut. J. Brown, slowly dying from a chest wound in their B.E.2c which had been brought down. An ambulance arrived, but Brown refused to enter it or to have his

wounds dressed before he had made his report, fearing that, if he were moved, he would faint from the pain. 'He very gallantly,' says General Chaytor, an eye-witness, 'held himself together till he had dictated his report and verified it; then, his duty done, fainted and died two hours later.'

Throughout the summer of 1916, though land operations were few, activity in the air was more or less continuous. The Germans, with their better machines, had the best of it despite the fairly frequent bombing of their main aerodrome at El Arish. On the 17th September, Short and Sopwith seaplanes from the *Ben-my-Chree*, which were to spot for two monitors and a sloop ordered to shell this aerodrome and targets in the neighbourhood, were engaged by a solitary Fokker. Well handled, it shot down two of them and drove off a third. By November 1916, when the weather made it possible to resume active operations, the British invaders of Palestine had reached a point more than half-way to its southern frontier. Their progress had been cautious, for it depended on the establishment of adequate lines of communication, but Murray had decided by then that he could make a bid for El Arish, an essential coastal base for further action against the Turks. An attack proved unnecessary. On the 21st air observers reported that our cavalry were in the town and meeting with no resistance. Ten miles inland, Murray had, however, to fight for El Maghaba, of which the capture was necessary to secure the right flank of the advancing force. The assault was delivered on the 23rd December, and its commander was at first misled by an air report stating that the position was being abandoned by the enemy. What appears to have happened is that some of the auxiliary Arab forces serving with the Turkish Army fled as soon as R.F.C. bombers appeared above their heads. Their masters were made of sterner stuff and offered determined resistance, which was broken only in the afternoon. A raid by the Desert Column resulted in the capture of Rafah on the 8th January. The R.F.C. gave warning that Turkish reinforcements were on the way, and the final charge captured the position only just before they arrived. It seemed that though slow, the invasion of Palestine would be sure, when orders arrived from London which in effect postponed all large-scale operations until the autumn of 1917.

The interval was filled by a large number of reconnaissance and a smaller number of bombing raids. More of these would have been made had there not been fear of retaliation against the railway, which was making steady progress. In one of them, delivered on the 20th March, Lieutenant F. H. McNamara of No. 67 (Australian) Squadron won the Victoria Cross for rescuing a brother officer forced down near the enemy. Four days later

Lieutenant W. E. L. Seward was compelled to land near Ashkelon. To avoid capture he came down in the sea and was at once under enemy fire from the shore. His determination not to be taken prisoner was such that he swam, not towards, but away from, the shore, casting off his clothes until he was naked. After four hours he reached land farther down the coast and set off along the beach in the direction of the British lines. Five times he had to take to the sea to escape enemy patrols, but he got away.

By March 1917 Murray felt himself strong enough, now that the railway had been pushed so far ahead, to attack Gaza. He accordingly set about concentrating his forces, but in so doing suffered the fate which had several times overtaken his opponents. His dispositions were very fully observed by the German Air Force, which, according to Djemal Pasha, the Turkish commander, saved the situation. When Murray moved, the Turks were ready for him, and his attack failed, although the Desert Column reached the gardens surrounding the objective. There is no doubt that our defeat in the first battle of Gaza was due to the superiority of the Germans in the air. By then their pilots were equipped with Halberstadts which could outfly the B.E.2cs and Martinsydes, and they relentlessly drove home the lesson that numbers—the R.F.C. had more machines than the Germans—and courage are no substitutes for efficient aircraft. The loss of this battle had a grave effect on the Palestine campaign and postponed ultimate victory by many months. Seldom has the soundness of the adage ‘Penny wise, pound foolish’ been more strikingly demonstrated.

Despite his lack of success at Gaza, the Cabinet ordered Murray to press on, defeat the Turks, and occupy Jerusalem. A glance at the map will show that such instructions could not be carried out until Gaza fell, and a month later Murray made preparations to redeem his first failure. The assault was delivered in two phases, the first designed to bring the attacking troops to within easy distance of the city, which was then to be heavily bombarded and assaulted in strength on the next day. The advance began on the 17th April, and was successful. On the 18th the bombardment opened by sea and by land, but on the 19th the main assault failed, for the position was still too strongly defended. On the next day the R.F.C. performed a signal service. Some two thousand Turkish infantry were discovered, with eight hundred cavalry, in a wadi, about to launch an attack on the British right flank. Four aeroplanes dropped forty-eight 20-lb. bombs upon them and dispersed them in confusion.

Up to this date, April 1917, operations in this theatre of war had proved slow and unsuccessful. The R.F.C. had done all that it could, but, for reasons already given, the help it was able to

FREEDING THE HEDJAZ

give to the Army had been inevitably limited. Yet its pilots and observers had striven, not unsuccessfully, to play the part foreseen for them, perhaps, by the author of the book *Ecclesiastes*: 'For a bird of the air shall carry the voice, and that which hath wings shall tell the matter.' But the situation was slowly changing as the result of an event which had occurred in the summer of the previous year. On the 5th June 1916 Hussein Ibn Ali, the Grand Sherif of Mecca, who ruled the kingdom of the Hedjaz, revolted against the Turks. Four days later the Royal Navy began to bombard the port of Jidda in the Red Sea. Its vessels were soon reinforced by the *Ben-my-Chree*, whose aircraft completed the work of the naval bombardment. 'Probably the seaplanes decided the matter,' said Captain W. H. D. Boyle, R.N., the officer in command, in his signal reporting this success. The capture of this port was of great importance, for the Arab rebels could now be supplied. The revolt met with varying success, and by the end of September most of the Hedjaz was free of Turkish troops, though they still held the railway to Medina. With some difficulty, for the Moslem prejudices of the Arabs were not easy to overcome, six aircraft of No. 14 Squadron were sent to Rabigh, where an aerodrome was established, and from it Captain R. H. Freeman and Lieutenant S. K. Muir made a praiseworthy attempt to cut the railway, flying three hundred and fifty miles to do so. At one time it seemed that the Turks, who had been reinforced, would be able to recapture both Rabigh and Yenbo. At first their advance was swift, but on the critical days of the 10th and 11th December, carrier-based aircraft, operating over the port of Yenbo, bombed and machine-gunned their forces with such effect that the assault was not pressed home. The next month Wejh was occupied, and to it the Flight, based on Rabigh, was transferred in March. Much useful and hazardous work, spying out the dispositions of the enemy, photographing his lines, and bombing him whenever possible, had been performed and, throughout, the relations of officers and men with the chiefs of the various Bedouin tribes had been cordial. Their private quarrels—and they were many—had constantly to be composed, largely by that unwearied genius, Colonel T. E. Lawrence; but however difficult it proved at times to keep them in the field, they always showed great friendliness to the R.F.C. Their imagination had been fired by these strange new engines of war sent to their aid, and they were quick to help in the transport of supplies and the choice of landing-grounds. 'We should prefer you coming out to us,' wrote the Emir Ali to Major A. J. Ross, commanding the Flight, on the 2nd March 1917, 'to inspect the spot we are about to select as an alighting place for the aeroplanes. Accordingly have we sent to you Dakhil Bin Tallal and Atiya Bin Muheisin that you may set forth in their

company to us. Moreover, they have with them a trotting she-camel for your mount.' It was intended to keep the Flight with the Arabs as long as possible, but a sandstorm which blew across the landing-field at Gayadah on the 16th July so badly damaged all the aircraft that they became unserviceable and were recalled to Egypt.

Such were the beginnings of the Arab revolt, which was part, and a very important part, of the campaign against the Turks. Up to June 1917 it had been a slow, laborious business with many disappointments and few achievements. On the 29th of that month, however, a new and very notable figure stepped upon the scene and quickly transformed a dull and mediocre piece into a triumphant and resounding success. On his arrival at General Headquarters, soon to be shifted from the pleasant or dubious delights of Cairo to places far closer to hardship, desert sands, and the enemy, General Sir Edmund H. H. Allenby put forward a strong demand for air reinforcements, and he was careful to specify that the machines must be of the latest type. Elderly B.E.2cs would be useless for the task he had in mind. Offensive operations could not begin immediately, and there was time, therefore, for them to reach him. On 27th October when the campaign opened, he had four squadrons in full fighting trim. Not all their aeroplanes were modern, but mingled with the B.E.2es and R.E.8s were a number of Bristol fighters and Vickers Bullets.

The R.F.C. played a major part in the preparations for the offensive. They concentrated on photography, and it was due to their unremitting labours that a vital weapon for the forthcoming attack, accurate maps of southern Palestine, was placed in the hands of the Army. Until the Palestine Brigade came into being on the 5th October, this work of photography had been carried out by one officer of the 5th Wing, Lieutenant H. Hamshaw-Thomas. His dark room was either a wooden case which had contained an aeroplane, or a tent. Both were insufferably hot, he was always short of the necessary chemicals for developing negatives, and water was heavily rationed. Nevertheless, with the advent of more staff and better equipment in adequate quantities he completed his task, and the Army was soon in possession of a mass of information concerning Turkish fortifications and battery positions.

The never-ending task of artillery observation, which had proved of such worth in France, was also put on a sound basis, until fifty-three wireless stations, fully equipped and manned, attested the determination of the R.F.C. to see to it that the guns should not fire blind. Observation flights were not easily made. The B.E. aeroplane in that climate, and loaded as it was with wireless equipment, had a ceiling of at most five thousand feet.

DECEIVING THE TURKS

It was slow, and without escort would have fallen an easy prey to the faster German fighter aircraft. The D.H. Scouts, Vickers Bullets, and Bristol Monoplanes went some way towards giving the necessary protection, but it was not until the beginning of October that a few Bristol fighters arrived. On the 8th they brought down the first enemy machine to fall within the British lines. At long last there was a real possibility of establishing local superiority in the air. Bombing was also carried on, both by the R.F.C. and seaplanes from the carrier *Empress*, a successful attack being made on the 23rd June on the railway station at Tul Karm, known from the reports of spies to be crammed with stores. A Turkish headquarters on the Mount of Olives was attacked a few days later. The pilots taking part in it returned by car and on foot. Their engines or their petrol had given out and they had all had to land before reaching base.

Thus by the fourth week in October 1917 all was ready for the third battle of Gaza. The two previous assaults had failed; this time, however, the plans were very different. Allenby intended to deal the Turks a crushing blow, but this he would not be able to do by laying siege to their strongest position. Even if a frontal assault on Gaza were successful, the enemy would be merely driven back to his next prepared defences and the whole weary business would be to do again. Allenby's plan was, therefore, to seize Beersheba on the enemy's left flank, and then push forward, driving a sharp sword into his side. While he was gasping from this unexpected thrust, a swift assault would be made against Gaza. For success it was essential to cause the Turkish commander to believe that it was against this heavily fortified position that the main blow would be struck. He would then concentrate his reserves at that point and be unable to meet in time the threat to his flank. Every means to deceive him was, therefore, practised. False wireless messages were frequently broadcast, and it was given out that Cyprus was to be used as a base for secret operations. To discover the truth of this rumour the Turks sent a German aeroplane over the island, but its observer reported that the British preparations on it were not such as to induce the belief that large bodies of troops were about to make use of it as a base. The Turks, therefore, remained undeceived, and the days were passing. Finally Allenby hit on a ruse which might have come straight from an adventure story. A staff officer, with a small escort, carried out a seeming reconnaissance in a part of no-man's-land known to be patrolled by Turkish cavalry. Encountering a troop of these, he exchanged shots and then, pretending to be wounded, galloped away, leaving behind him a blood-stained haversack which held a variety of personal belongings and the report, elaborately faked, of a conference held at British

THE WHOLE PLAN ENDANGERED

General Headquarters at which the decision to launch the main attack on Gaza was carefully and unmistakably recorded. The Turks were entirely deceived and at once discontinued their fortification of Beersheba.

To maintain them in their delusion it was vital to prevent German air reconnaissance. The troops to take part in the Beersheba attack were moved at night, and the R.F.C. maintained defensive patrols from dawn to dusk. All went well until the 30th October, the day before the assault, when two German airmen in a reconnaissance plane, taking advantage of cloud cover, penetrated far into our lines and discovered the truth, which they confirmed with photographs. For a brief moment Allenby's plan was in jeopardy; but the German machine carried no wireless and on its return journey met with a Bristol fighter, which shot it down. Its occupants with all their notes and marked maps were captured. On that brief encounter, in the torrid, bumpy air above an inhospitable desert, the fate of the campaign may well have depended. The tactics of deception were continued by the naval bombardment of Gaza which opened forty-eight hours after the beginning of the land bombardment. It was directed by seaplanes from the *City of Oxford*, *Empress*, and the *Raven II*.

Three days before the attack, Allenby became anxious about the maintenance of air superiority. Being reliably informed that the German air force opposed to him was about to be brought up to a strength of five squadrons, he demanded two more squadrons, one of D.H.4 bombers and the other of S.E.5s and Bristol fighters. This request the War Office refused on the grounds that they were needed on the Italian front. The minds of those employed, or who work in, Whitehall, are not always easy to understand. On this occasion Allenby had been directed by the Government to secure the elimination of Turkey from the war at a single blow. These were the instructions which he received at the beginning of October, and yet three weeks later, when he was about to fulfil them, he was denied just that additional measure of air reinforcement which might have made the difference between defeat and victory. That he was successful without them is no argument, for to be wise after the event is easy. The fact remains that, at a most critical juncture, the only theatre of war in which a profitable, perhaps a decisive, blow might have been struck, was refused additional air support, while, what was more, some of the pilots sent thither were so newly trained and sounused to war that more than one of them machine-gunned our own troops.

Nevertheless, despite these handicaps in the air Allenby was brilliantly successful. The attack on Beersheba was launched on the 31st October; it came as a complete surprise, and success was

immediate and overwhelming. By six in the evening the town was ours. Throughout the battle the R.F.C. flew fifteen reconnaissance sorties which were sufficient to keep the Commander-in-Chief fully informed of the situation. Of the six hostile batteries comprising the Turkish artillery, five were seen from the air and silenced by our guns. All hostile aircraft were driven off. Twenty-four hours later the frontal attack on Gaza began with an assault on Umbrella Hill, in which two machines of No. 14 Squadron took part. In bright moonlight they shot up enemy batteries, many of which, though not knocked out, were forced to cease fire at critical moments. In six brief days the whole Turkish defence crumbled, and on the 8th November there was a general advance along the whole front. Throughout the battle the photographic work of the R.F.C., though unspectacular, was of no little value. The staffs of the armies engaged in the attack were supplied with photographs of all new Turkish positions within four or five hours of the time at which they were taken. Observers beneath the balloons of the 21st Balloon Company, which had arrived from England in the previous August, registered many targets. Altogether during that week of close and successful fighting sixty-one targets were bombarded with their help, while the reconnaissance flights of the R.F.C. brought one hundred and twenty-six more to the notice of the insatiable guns. Mindful of the effect produced on the Dervish army near El Fasher by machine-gunning troops on the ground, the R.F.C. attacked bands of Turks retreating confusedly from the main defences.

Bombing attacks were especially fruitful. On the 8th November the new German airfield at Iraq el Menshiye, less than twenty miles from Gaza, was virtually put out of action, and on the next day very considerable results were achieved at El Tine. Here, near the railhead, was situated the main ammunition depot of the Turkish Eighth Army. It received direct hits. Much of it blew up, all communications were destroyed, the Turks made haste to flee, and in the words of the German air commander, Kress, 'many formations began to retreat without orders and broke into flight'. A great number of officers and men could not be stopped till they had reached Jerusalem or Damascus. This was the first of those panics in the Turkish army caused directly by air attack, of which the culmination was the slaughter in the Wadi el Far'a on the 21st September 1918.

The bombing of their temporary airfields meant the grounding of the German air force operating with the Turks. But these were not the only targets. From the 7th to the 14th November the R.F.C. dropped seven hundred bombs, mostly 20 lb. in weight, on such objectives as junctions, railway tracks and bridges, and troops on the march.

CAPTURE OF JERUSALEM

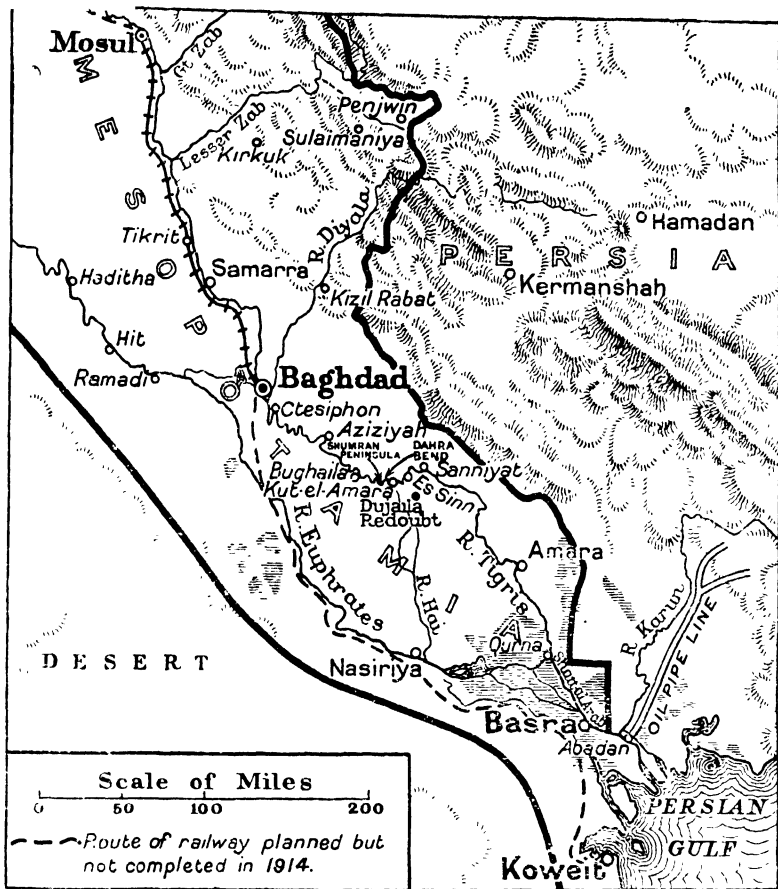
By the 21st November Allenby had reached Mizpa, five miles from Jerusalem. In an effort to defend a city which has changed hands no less than thirty-four times since its foundation, the Germans again took the air. No. 67 (Australian) Squadron, however, bombed Tul Karm, their aerodrome, by day and night, and made it impossible for them to offer any effective opposition. On the 8th December the attack on Jerusalem opened in pouring rain, and by noon on the next day British cavalry patrols had entered the city. The R.F.C. were temporarily grounded by the elements and were ordered to take no risks, for it was impossible to replace their machines if they were damaged. Nevertheless, No. 14 Squadron manhandled their B.E.2s to the top of a small, steep hill above their waterlogged airfield and, rushing down it, took the air with bombs for the demoralized Turks. They dropped one hundred that day in fifty hours' flying. On Tuesday, the 11th December, Allenby passed on foot through the Jaffa gate into Jerusalem. He may be left there savouring for a short, a very short, time the fruits of the first decisive victory of the land war, before proceeding to further triumphs. The operations in Mesopotamia, where a similar campaign was being fought, must now be briefly considered.

In 1914 Irak, as it is now called, consisted of three Turkish Vilayets—Mosul, Baghdad, and Basra. The south-eastern frontier of the last-named ran close to Abadan, the terminus of the pipeline belonging to the Anglo-Persian Oil Company. To preserve it and to use the products which issued from its mouth were matters of vital importance to the Admiralty. On the outbreak of war with Turkey steps were taken to secure the hostile port of Basra, which was captured on the 22nd November 1914. Though the Turkish attempt to retake it on the 14th April 1915 was frustrated, the position at that time was far from satisfactory. The local Arabs were restive and inclined to respond to the efforts being made, largely by German agents, to encourage a Jihad or Holy War, and the Turks, their masters, were striving to build up reinforcements. It was essential to reconnoitre the movements of both, but no aircraft were available, for the Government of India had sent all the pilots and machines to Egypt. To meet the urgent requirements of the Army in Basra, Australia provided four, and New Zealand one, trained pilots, and by the end of April 1915 a Flight had reached Basra and became part of No. 30 Squadron. The Flight consisted of four Maurice Farman Longhorns sent from England, two of which had to wait four months for their engines. The two serviceable machines, however, were soon in the air and helped the troops of Major-General C. V. F. Townshend in his advance on Amara, some hundred miles up the Tigris from Basra, by discovering enemy camps and

movements. The town fell into our hands on the 4th June at a cost of four killed and twenty-one wounded.

By the 25th July Nasiriya, on the Euphrates, had been captured, and the Turks were still retreating. By then the two elderly Farman were *hors de combat* and their places taken by two only slightly less elderly Caudrons, whose rotary engines gave considerable trouble. One of these machines made a forced landing in the desert and its Australian occupants fought a duel to the death with revolvers against a crowd of hostile Arabs. On the 27th July 1915 it was decided to push on another ninety miles, as the aeroplane flies, to Kut el Amara. There was but one machine available with which to reconnoitre the country ahead. It was flown by Major H. L. Reilly, who discovered a 'Torres-Vedras-like line of earthworks, entrenchments and redoubts of the most modern type' at Es Sinn, close to the objective. This information enabled Townshend to make the necessary dispositions, with the result that Kut was occupied on the 29th September.

Thus, in something less than half a year the main object of the campaign had been accomplished. By the beginning of autumn the whole Vilayet of Basra was in British hands and the pipe-line ending in Abadan was safe. Nevertheless it was decided to push on still farther and accomplish the capture of Baghdad. To do that it would be necessary to overcome the Turkish defences at Ctesiphon, once the winter residence of the Parthian kings. While making his preparations, Townshend received much-needed air reinforcements, consisting of four B.E.2c aircraft, which, added to the two Martinsydes, a Caudron, and the one remaining Farman, soon to be lost to the enemy, formed his total air strength. The reconnaissance these lumbering machines carried out shewed the inaccuracy of existing maps. Nevertheless the British commander decided that he had sufficient information, and on the 20th November began his advance along both banks of the Tigris. The next day he called for an air reconnaissance by two aircraft of the Ctesiphon position. One of them was flown by Major Reilly, who soon discovered that the Turks had altered their line of battle so as to make full use of important reinforcements. He flew up and down their lines, noting every possible detail, which he included in a sketch map, and had almost completed his task when the engine of his Martinsyde machine was put out of action by a splinter from an anti-aircraft shell. He was compelled to land and was captured by Arabs on his way on foot to the British lines. This misfortune had a very grave effect on the campaign, for the priceless information recorded in his map 'fell not into the hands of the enemy commander, but into those of the Turkish commander'. Moreover, 'Major Reilly's greatest gift to us,' says



THE CAMPAIGN IN MESOPOTAMIA

the Turkish historian, Muhammed Amin, 'was a sketch shewing the course of the Tigris. . . . It was an important map in the eyes of the Irak Command, for at headquarters and with the troops there was no such thing as a map.' The observer in the second reconnaissance aircraft, an inexperienced officer untrained in air observation, failed to discover the change in the Turkish dispositions. When, therefore, the attack was launched, it was a failure, and by the 7th December Townshend was driven into Kut and there besieged.

Efforts were at once made to organize a relief force known as the Tigris Corps. It was ill-equipped, ill-organized, and quite inadequate for the task. Its air force consisted of two aeroplanes, one of them unserviceable, the other three being shut up in Kut with Townshend. They did what they could, but rain turned landing-grounds into muddy swamps and made it impossible for

FOOD FROM THE AIR

them to carry out reconnaissances which in the open, flat country the cavalry was quite unable to provide, and which were indispensable for success. The Royal Naval Air Service, which, since September, had sought to play a part in the fighting, also did what it could to help. It possessed two Short seaplanes and two Voisin biplanes, but no one to fly them. The R.F.C. was in the opposite condition and was able to produce pilots with nothing to fly. The naval machines were handed over to them, but were soon mostly *hors de combat*. By now enemy aircraft, including Fokkers, began to make their appearance and to subject Kut to frequent bombing attacks, which, while they did little damage, shook the courage of its citizens. Protection was impossible, for no British machine could cope with the Fokker. An elderly Farman, which made a gallant attempt to do so, was shot down and its crew killed.

On the 7th March 1916 the Tigris Corps was more or less ready to attack the Turkish positions round the besieged town. It did so at dawn on the following day and the assault was a complete failure, though at first it came as a surprise. Turkish reinforcements reached the Dujaila redoubt, the key to the position, more quickly than the exhausted British infantry, some of whom had marched sixteen miles before opening the attack. Air observers watched, helpless, four battalions of Turkish infantry arrive at the position in plenty of time to beat back the British infantry. Being unprovided with bombs, the aeroplanes were unable to attack the enemy when on the move towards his defensive positions. There were no bombs on board them for the simple reason that they were barely air-worthy, and it was therefore too risky to overload them, for, had they been destroyed or damaged, the air force in Mesopotamia would have ceased to exist.

Another attempt to relieve the city, made on the 5th April, was more successful, but was far from being decisive. While the Tigris Corps was still struggling to relieve their extremely hard-pressed comrades, these were being supplied with food from the air and on occasion with gramophone needles, newspapers, letters, and a millstone. Four B.E.2cs, two naval Farmans, and three Short seaplanes, all unarmed, dropped altogether 19,000 pounds of food between the 15th and 29th April, and to do so carried out one hundred and forty flights. Lewis guns and ammunition were left behind, food and medical supplies were stowed in their place. Five thousand pounds of food per day were, however, necessary to give the garrison a ration of six ounces a head. It was never possible for the aeroplanes to drop this amount, and the largest quantity they succeeded in putting into the city in any one day was 3,350 pounds. German aircraft did their best with

some success to interfere with this, the first attempt to keep troops supplied from the air. The position in Kut became more and more desperate, and finally, after destroying his guns and ammunition, on the 29th April Townshend surrendered. Of the forty-four R.F.C. personnel captured, only six survived the rigours of the march back as prisoners from the Tigris into Anatolia.

Both sides were now exhausted, the jubilation of the Turk being tempered by the many and constant difficulties of transport and supply which threatened to undo his gains, the British grimly determined to avenge the fall of Kut. Of the combatants none were in worse shape than the officers and men of No. 30 Squadron. The first had flown rickety aircraft, freighted with food, in all kinds of conditions, in a supreme endeavour to keep the garrison of Kut supplied with the bare necessities of life. The second had laboured long and arduously to maintain those rickety machines in a condition far from air-worthy but at least in one in which they were able to fly. The success, which failed to crown their efforts, eluded them not from any lack of spirit and determination on their part but because the task of supplying so many men with so few aircraft was beyond their strength. Throughout the month of April, when they were flying daily over the beleaguered town, eight pilots had been on full duty. When the strain was relaxed all but two yielded to fatigue and the vile climate and were admitted to hospital. By June Sir Percy Lake, soon to hand over his command to Major-General F. S. Maude, had to report that the enemy had been able 'to establish what was very nearly a mastery of the air'. By this time the detachment of the R.N.A.S. had been withdrawn entirely. Their machines were quite unsuited for work on the Tigris. The physical conditions under which the R.F.C. and R.N.A.S. had to operate must be borne in mind. The fierce sun warped the wooden air-frames, the ever-present sand choked engines; flies and fever played havoc with pilots and ground staff.

Matters stood thus until the end of July 1916, when the much-needed reinforcements began at last to arrive. By August No. 30 Squadron could put thirteen serviceable B.E.2cs into the air, with seven more undergoing repair and a further seven being unloaded at Basra. They immediately resumed operations against the enemy and did considerable damage to his main aerodrome at Shumran. By October Maude was ready to advance again, but great caution had been enjoined upon him by the British Government, which, being unable to reinforce him, urged him to conserve his men and material. He began his advance on the 14th December against the Turkish positions covering Kut, and during the operations of the next few days, which involved the passage

of the River Hai, his air force made up by the accuracy of its reconnaissance for the inaccuracy of its bombing. Several efforts were made to cut the Turkish bridge of boats across the Tigris east of Shumran, but no one succeeded in hitting it. On the other hand, all enemy movements on the ground were correctly reported and Maude was able to base his future plans upon the information thus obtained. Pausing after the first attack to consolidate, he moved forward again on the 15th February, and by the next morning the Turkish position on the Dahra Bend of the Tigris had been overrun and two thousand prisoners captured. This success had been due very largely to the excellence of his artillery fire directed by wireless messages from the air.

Before victory could be achieved, however, the strong Turkish position at Sanniyat had to be captured and the Tigris crossed. As at the third battle of Gāza, which took place eight months later, it was vitally important to prevent the enemy discovering the British dispositions. The method adopted by No. 30 Squadron was to bomb the German aerodrome from dawn to dusk. Relays of machines kept the German air force grounded until 5 p.m., when one enemy pilot got at last into the air, just too late to achieve any useful purpose. Throughout that day Maude's army had been streaming across the Tigris, and half an hour before the German machine took off, his bridge of boats across the swirling river—it was in spate—had been completed. That evening, the 23rd February 1917, Lieutenant-Colonel J. E. Tennant, in command of the R.F.C. in Mesopotamia, was told by Maude that on the morrow he could do what he liked. 'An army on the run over flat desert,' he noted, 'and the complete mastery of the air, one's wildest dreams had come true.' One more day was, however, to elapse before he could fulfil his dream. It was not until the 25th that the British army was in full pursuit of the Turks, streaming back from Sanniyat to Shumran. Throughout that day their main body, discovered early in the morning at Bughaila, was bombed until it became demoralized. On the next day the retreat became a rout, and on the day after a British pilot could report that 'dead bodies and mules, abandoned guns, wagons, and stores littered the road. . . . I came up with the rear party on the march. Flying along about ten feet from the road, I mowed down seven with one burst of machine-gun fire; it was sickening . . . those hit just crumpled up under their packs and lay still; others waved in token of surrender.' It was in a successful endeavour to improve upon such scenes of slaughter that the Luftwaffe a generation later dived upon long processions of unarmed refugees crawling across Poland, Belgium, and France. By now the Turks were incapable of organized defence, and on

the 11th March 1917 Maude entered Baghdad. The enemy's demoralization, however, did not last for very long, and before the end of the month their armies had rallied and were once more offering staunch and skilled resistance.

Leaving the Turkish XIII Corps to be dealt with by the Russians advancing through Persia, with whom he had got into contact by means of an aeroplane from No. 30 Squadron, Maude concentrated against the Turkish XVIII Corps entrenched near Samarra in country much cut up by nullahs and canals, for the desert had at last been left behind. By now the German air service operating with the Turks had been reinforced with Fokkers, but to counteract them No. 30 Squadron had received a few Bristol Scouts. Oberleutnant Schuz, in command of the newly arrived German fighters, had done his utmost to spring a surprise on the R.F.C., and had brought them up to the front by a flight of three hundred miles in one day. He intended to take them into action on the next, when their appearance would, he hoped, produce a marked effect. In this he was disappointed. They had hardly touched down when a British machine flying at a great height dropped a message complimenting the German flying officer on his return to the front, offering him a warm reception in the air and a tin of cigarettes. After some days of confused fighting the Turks were once again driven back, and by the end of April 1917 Baghdad was secure.

The summer of that year proved abnormally hot even for Mesopotamia, and little fighting took place, though the R.F.C. did their best to harass the Turks when opportunity offered. On the 11th July, for example, an attempt was made by three aeroplanes to bomb the Turkish lines at Ramadi, near the Euphrates. The thermometer stood at 121 in the shade; the water in their radiators boiled away and the pilots were sick with heat. Reinforcements in the shape of No. 63, an R.E.8 squadron, arrived in August, but the fierce climate soon proved too much for men who had fought in the misty skies above the Somme. Very soon only six of thirty officers, and seventy out of two hundred men were fit for duty. Nevertheless the survivors soon gave a good account of themselves in the September fighting around Ramadi and allowed no German machine to interfere with the operations necessary to secure its capture.

The days went by filled with desultory air fighting, in which more than one pilot, after being forced down, was picked up by a comrade who landed beside him and took him away, sometimes standing on the wing of a Martinsyde. On the whole, steady progress was being made, Tikrit being captured at the end of October, and the Turks being forced everywhere to remain on the defensive. Their communications were not safe, for they could

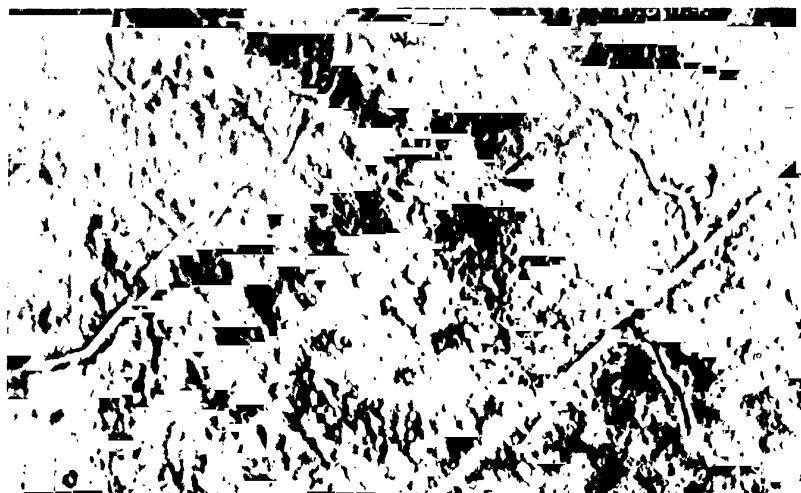
VICTORY IN SIGHT

never be sure of freedom from air attack. On one occasion they sent a convoy of one hundred and sixty camels across the desert from the Tigris to the Euphrates by an out-of-the-way route, deeming that it would not be seen. Yet in the afternoon of the 5th December aircraft of No. 63 Squadron appeared from their base miles away in Baghdad, bombed and machine-gunned the camels from three hundred feet, dispersed the column, and disrupted the convoy. Thus at the turn of the year, after many set-backs, the British armies both in Palestine and Mesopotamia had got the measure of their tough opponents and were well on the way towards the victory which was to crown their efforts in the following year.



THE *CLIMAX*, *SPRING 1918*. During the last great German offensive, the R.A.F. was born. (*Above*) Pilots and ground-crews of a Bristol Fighter Squadron, April 1st. (*Below*) Interrogation of air-crews, near Albert, March 25th





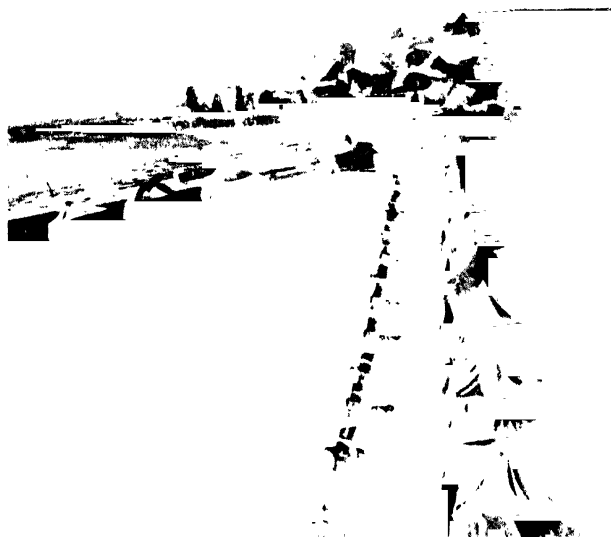


(Above) Airfield near Albert, with R.E. biplanes during the Battle of Bapaume
 (Below) 'Richthofen's circus' of fast Albatros fighters. Flanders 1917

(Left)

*The Western Front
 from the Air*

Trench raid
 Tank attack
 Gas attack





Gallipoli. A Shorthorn Maurice Farman after a forced landing near Chocolate



Mesopotamia. Packing provisions for the besieged garrison of Kut in April 191



Suvla, the scene of some of the most heroic and desperate fighting in the war



A Henri Farman of No. 30 Squadron takes off to drop the food sacks over Kut



Palestine. Turkish troops bombed or the Damascus road

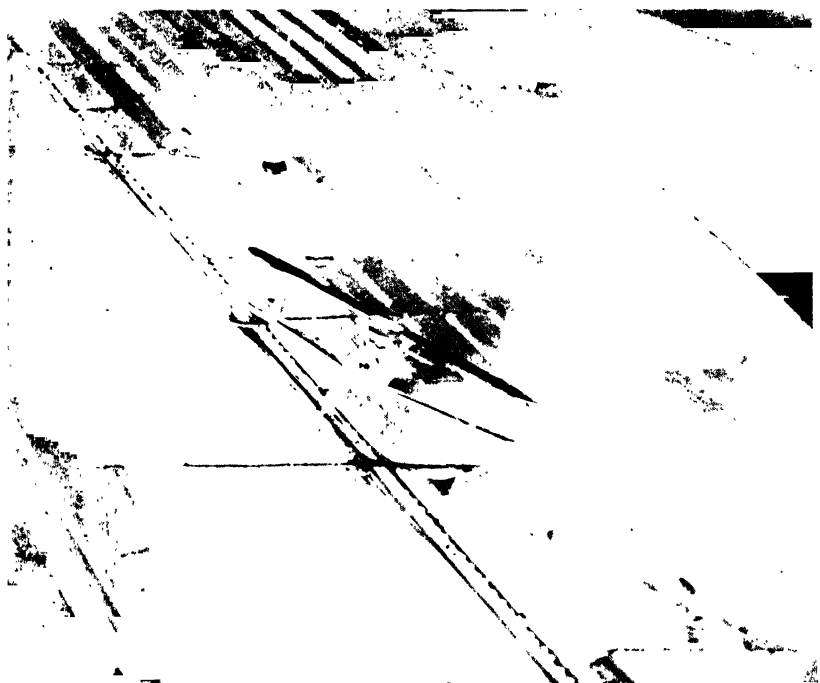


Turkish transport destroyed by bombing on the Nablus-Beisan road, Sept. 1918

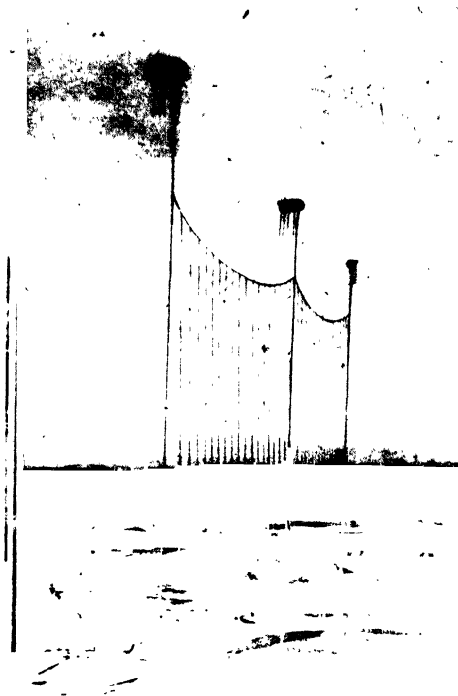




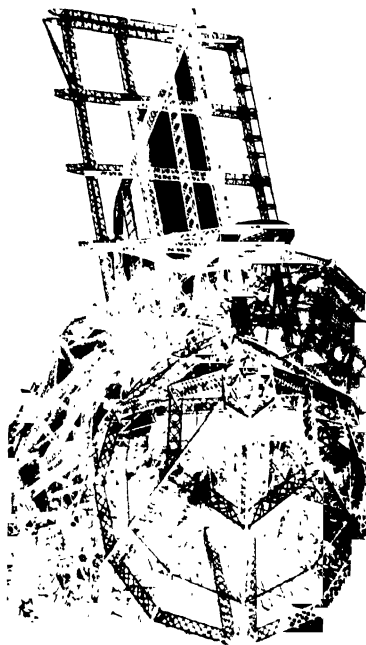
R.F.C. armoured cars salving a Martinsyde from a recaptured Turkish airfield



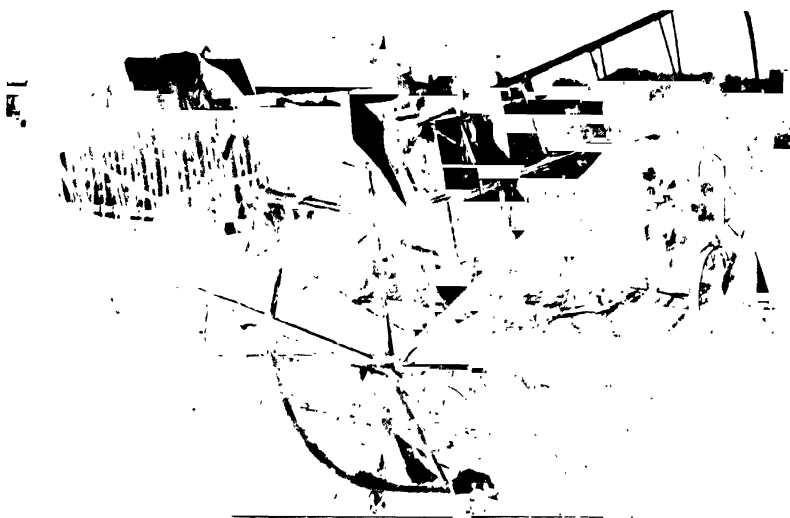
Italy. A Sopwith, piloted by Major W. G. Barker, V.C., over vineyards



1.



2.



3.

Home Front. (1) Balloon apron used in defence of London
 (2) Wreckage of a Zeppelin brought down over England
 (3) Remains of a Gotha bomber, Margate, December 1917

13. Air Defence of Great Britain 1914-1918

BEFORE following any further the fortunes of the R.F.C., the R.N.A.S., and later the R.A.F. in Europe and in the other areas, it is necessary to survey the home front, for upon its strength and fortitude the success of the operations upon the high seas, in the field, and in the air in no small measure depended. To those who endured the blitz of 1940 and the subsequent attempts by the Luftwaffe to bring home to the citizens of Great Britain the large futility or wickedness of making war on Germany, the air attacks made by the same foe in the years 1914-18 might doubtless appear trivial. That opinion, however, would certainly not have prevailed at the time, nor should it be forgotten that one reason why the Germans failed in those years to deluge our cities with bombs was that they lacked the technical means to do so. No consideration of humanity or expediency deterred them; they did their best and, if they failed, it was not for want of trying.

That Great Britain would be subjected to attacks from the air seemed possible as early as 1910, when an Admiralty conference met to consider means of protecting naval magazines, cordite factories, dockyards, and other vital places from an aerial attack which they knew no clause of The Hague Convention would prevent. Two years later the same problem was considered by the Committee of Imperial Defence, and certain steps were taken. The habitual differences of opinion between the Admiralty and the War Office were, as usual, not slow to manifest themselves. Indeed, as will shortly become evident, the quarrels of these two great departments of State added not a little to the intrinsic difficulties of the problem of defence. A temporary agreement, by which the Admiralty was to defend Admiralty property, was repudiated by the War Office shortly before August 1914. That department claimed that the Army alone should bear the burden of preserving these islands and all within them, naval bases included, from the threat of air bombardment; naval aircraft could help to keep safe their own if the Admiralty so wished, but the primary responsibility must rest with the War Office. In seeking to assume it, they ignored the fact that of the one hundred and sixty-two aircraft estimated by Sir David Henderson to be the minimum necessary to ensure an efficient defence, not one was available. Moreover, as if to emphasize their *insouciance*, when the Four Years War broke out they immediately dispatched the whole fighting strength of the R.F.C. to France. At that moment had the Germans chosen to conduct a bombing campaign against this country, they could have done so with impunity,

TO DEFEND THE REALM

except for possible interference from a few R.N.A.S. aircraft stationed at certain points round our coast. That this claim of the War Office could never be made good in practice had been realized by Winston Churchill as early as 1912, and in that year, as First Lord, he had begun to collect what aircraft he could with which to defend the Realm. The War Office were annoyed and continued to urge that they alone should assure the defence. 'When asked how they proposed to discharge this duty they admitted sorrowfully that they had not got the machines and could not get the money. They adhered, however, to the principle.'¹ On the 3rd September 1914 they abandoned even this attitude and the air defence of Great Britain passed formally to the Admiralty.

Fortunately, while this engagement was being fought in Whitehall, no battle developed in the air. The Germans were not ready. Of the six army Zeppelins in service at the outbreak of war, three were shot down on their first operational flight, and of the naval craft the L.1 fell into the North Sea on the 9th September and the L.2 caught fire and was burnt to a cinder six weeks later. These fortunate disasters disposed for the time being of most of the trained airship crews and damped the enthusiasm of the survivors. It was, however, soon greatly improved by the efforts of the energetic Kapitanleutnant Peter Strasser. Bases were established at Nordholz, Tondern, Hage, and Seddin, and the services of Doctor Eckener, the man who knew most about Zeppelins, were secured. The destruction by the R.N.A.S. of the Zeppelins in their sheds at Friedrichshafen and the attack on Dusseldorf roused the German General Staff, and on the 15th January 1915 permission to attack London was obtained, provided that great care was taken not to damage historic buildings and private property. The next generation of Germans were to shew themselves less scrupulous.

The organization of our own defences, notably those of London, was taken in hand by the Government, and an area round Buckingham Palace and Charing Cross declared to be a vital centre and provided with guns and searchlights. These were manned by special constables and civilian volunteers who soon formed the nucleus of an anti-aircraft corps which gradually expanded as more guns and searchlights became available. Aeroplanes to defend both the capital and some of our principal cities were allotted to a number of bases on or near the coast, and air patrols instituted to intercept raiders either during an attack or on their return from it. There was also the R.N.A.S. station at Dunkirk, whose aircraft would, it was hoped, be able to do likewise on the other side of the Channel. They were soon to score a success.

¹ Winston Churchill, *The World Crisis 1911-1914*, p. 208.

In sanctioning air attacks on England the Kaiser had, to a certain extent, been influenced by public opinion in Germany which, from the first, had pressed strongly for the bombing of this country. Schemes to achieve this purpose included the dispatch to London of a spherical balloon with a crew and a ton of bombs. Three attempts to do so were made and failed; but the Germans are nothing if not ingenious in discovering means of destruction, and by the middle of January 1915 nine new Zeppelins were in the hands of their army and navy, that number being reduced a month later to seven after a storm had destroyed two of them over Denmark. The first Zeppelin raid was carried out on the 19th January on Norfolk, a small amount of damage being done to a number of peaceful villages near Cromer and Hunstanton. The Germans had already forgotten their determination to attack only military objectives. Our counter-measures took the form of a black-out and a mobile anti-aircraft force with headquarters at Newmarket to cover the whole of East Anglia. Guns to protect such great centres of industry as Sheffield, Birmingham, Coventry, and other places were gradually put into position, but the main defences still remained concentrated in the Chatham-Sheerness area.

The first attack on the metropolitan area of London was made on the 26th May by the LZ.38, and the casualties caused by the ton weight of bombs dropped were seven killed and thirty-five injured. Ten days later the LZ.37, co-operating with a number of naval Zeppelins, bombed Hull and Grimsby, doing a considerable amount of damage. On the way back she was intercepted by Flight Sub-Lieutenant R. A. J. Warneford from Dunkirk. He climbed above her, and, dropping a string of small bombs, split her huge envelope and sent her down in flames. The Zeppelin fell on a Belgian convent and a number of nuns lost their lives. Warneford's machine became momentarily uncontrollable from the blast caused by the Zeppelin's explosion in mid-air, and with great difficulty he made a forced landing behind the German lines. Before he could be captured, however, he succeeded in repairing a fractured oil pipe and re-starting his engine, a feat of some moment since it involved swinging the propeller and then making a leap for the cockpit. He took off again and landed safely behind our positions in Belgium. He was awarded the Victoria Cross, and was killed a few days later in a crash.

Deeming their experiments against London to be not unsuccessful, the German High Command persuaded the Kaiser, apparently somewhat against his will, to authorize further attacks on our capital. On the 20th July he gave the required permission, but the first raids missed their objective. On the night of the 9th-10th August the L.10, for example, under the impression that

BOMBS ON THE CITY OF LONDON

she was bombing London, bombed instead the Eastchurch naval aerodrome, and smashed a large number of windows. A companion Zeppelin, the L.12, which had bombed Dover in mistake for Harwich, came down in the sea off Zeebrugge and was there bombed by naval pilots from Dunkirk. We usually received adequate warning of the approach of Zeppelins by intercepting their wireless signals.

It was not until the 8th-9th September that the city of London received its first high explosive bombs. They fell from the L.13, commanded by the resolute Kapitanleutnant Heinrich Mathy, killed twenty-two persons and injured eighty-seven. Though fired at by all the twenty-six guns comprising the entire ground defences of the capital, the L.13 departed unscathed, and of the R.N.A.S. pilots who had taken off from Yarmouth to intercept, one was killed by the explosion of his bombs on landing. After this raid, Press agitation was considerable, the newspapers very sensibly urging that the defence of the capital should be placed in the hands of a single officer. The Admiralty yielded, and appointed Admiral Sir Percy Scott who, however, had to threaten resignation before he was given a free hand in the matter of strengthening the defences. Scott, however, was concerned mostly with ground defences, the air defence being in the hands of a sub-committee and of Rear-Admiral C. L. Vaughan-Lee.

At that time official opinion was divided on the question of the best form of defence. Some favoured anti-aircraft guns, others night-flying aircraft. Both theories were tested in the last raid of the year, on the night of 13th-14th October, when three Zeppelins reached London. The L.15, though caught in searchlights, dropped strings of bombs along the Strand and across the City to Limehouse. The other Zeppelins failed to get over the centre of the City though one bombed Croydon. Aircraft of the Royal Flying Corps went up but had great difficulty in finding the airships. Clearly many more searchlights were necessary and it was decided that they should be concentrated, as far as possible, in two rings, an outer and an inner, the object being to pass on the airship, once it had been picked up by a searchlight of the first, to one of the second. Nine electric tramcars were fitted with searchlights, which could thus be moved to any threatened spot. The October attack had shown that our coastal air defences were far from perfect. No naval aircraft had gone up during the raid and this appears to have been due to lack of machines, less than half the number required for patrol having been supplied. As a temporary measure two light-draught paddle-steamers, each carrying two or three Sopwith Schneider Cup seaplanes, were commissioned at Killingholme and Yarmouth with orders to put

to sea on favourable nights and send their aircraft up on a line fifty to sixty miles east of our coasts.

For the remainder of the autumn and well on into the winter, no more Zeppelins attacked this country. The German Command was busily reorganizing. By the last day of January 1916 they were ready, and nine naval airships set out from Nordholz, Tondern, and Hage. Fog prevented Commodore Tyrwhitt from taking his light cruisers to sea with the object of intercepting the Zeppelins, who were reported in the air soon after noon. On reaching England, rain and snow were encountered and ice began to form on their envelopes. The objective was Liverpool, and before it was reached three Zeppelins had fallen behind. They dropped their bombs haphazard over Norfolk and caused very few casualties or damage. Of the remaining six, several bombed Burton-on-Trent, one Scunthorpe, and one Walsall in mistake for Liverpool. The L.19 bombed the Tipton-Wednesbury area. She then developed engine trouble and eventually came down in the North Sea and was lost with all hands. In this raid the defences had been virtually non-existent. Though fourteen pilots had gone up from mist-covered aerodromes, no airship was seen. The effect of this attack on the public mind is best gauged by the spate of reports of the sighting of Zeppelins which flowed in throughout the first half of February. They were seen over places as far distant as Manchester and Bath, but existed only in the public imagination, for in point of fact no further raid occurred until the night of the 5th-6th March.

It was obvious that the defences would have to be strengthened. The pilots of the night-flying aircraft had the will—many of them, though it meant certain death, being perfectly prepared to ram an airship—but had not yet found the way, and it was not until the night of the 2nd-3rd September that success rewarded their efforts. By then fifteen more raids had been made, mostly over the eastern part of England in an effort, not very often successful, to reach London. The Germans were obsessed with the importance of bombing the capital of the Empire, and in so doing played into our hands, for they enabled our slender defences to be concentrated.

As usual, the organization of these took much time and was the subject of indecision, conflict of purpose, and of policy. All through 1915 the Admiralty and War Office were hopelessly at loggerheads. The first had little faith in the aeroplane as a weapon of defence; the second, still clinging to the principle that home defence was their duty and no one else's, sat back and were content to shoot at the Admiralty rather than at the enemy. Efforts were made in May and June to shift the responsibility from the Admiralty back to the War Office. They were a dismal

DIVIDED COUNSELS

failure. When faced with the prospect of having to take action, the War Office became vague and elusive. If the R.F.C. in France made no further demands, then it might be possible to meet the requirements of home defence about January 1916, but no definite undertaking could be given. After months of wrangling, Balfour put the question before the War Committee of the Cabinet on the 29th November 1915. Even this had no effect; the Committee was content to take note that the 'Admiralty and the Army Council had agreed in principle on the transfer of responsibility'. Shortly after, Kitchener, who had been absent on a visit to the Dardanelles, returned and at once vetoed all proposals to supply home defence with aeroplanes or anti-aircraft guns. The needs of the army in France were, in his view, paramount. Such existing material as the Army had taken over or already possessed could be put under the control of the Admiralty. Thus did those in authority fight among themselves. It was indeed fortunate for England that the enemy made so little use of his opportunities, for not until the end of February 1916 did order succeed chaos, when French, as Commander-in-Chief Home Forces, was given charge of the defence of London from air attacks.

To understand the position of the R.F.C. in this question it is necessary to go back a little in time. In January 1915 all military air stations east of Farnborough had been ordered to keep two aeroplanes ready to intercept attacks by night. During the next few weeks, landing-grounds were prepared near London, and in May seven R.F.C. stations close to the capital or in the Home Counties were made responsible for the R.F.C.'s contribution to the defence. The aeroplane to be used was the Martinsyde Scout armed with bombs. The airship attacks soon showed how futile was this form of defence. Kitchener lost his temper, and when informed by Henderson that it was for the R.N.A.S. to provide the necessary air defences, replied in a rage: 'If there are any more Zeppelin raids and the R.F.C. do not interfere with them I shall hold you responsible.' Henderson did what he could but it was little enough, for there were neither pilots nor machines available, and it was not until March 1916 that an establishment of ten squadrons for home defence was laid down and the 18th Wing, under Lieut.-Colonel F. V. Holt, formed to include all the air defence detachments in the London area. By the middle of July a scheme for a 'barrage' control and a barrage line of searchlights through the Eastern Counties was adopted but never fully implemented, and by the end of the year, only about half the number of aircraft allocated on paper to the home defence squadrons had reached them. With the exception of a few F.E.2Bs, the machines were all B.E.s of an obsolete type armed at first either with bombs or the Ranken explosive dart, for which Lewis guns firing

DIFFICULTIES OF INTERCEPTION

explosive and incendiary bullets of the Buckingham, Brock, or Pomeroy variety were gradually substituted.

While the R.F.C. was thus trying to achieve some form of effective organization, a warning system was established and observer posts set up all over the country. They were connected with warning control centres and gradually began to prove their worth. Girls' names were used as code words to describe naval Zeppelins, and boys', military. The system of warnings to the police and to the general public was also established and a black-out imposed. The effect on the population of these measures for their safety was curious. In October 1915, for example, the Chief Constable of Hull reported that the buzzer warning 'has been opposed by a good many of the upper classes but there is an almost unanimous desire for it among the other classes, and I have insisted on its being kept'. Hull seems to have been specially sensitive on the subject of airships as in the next war it was to be on that of bombers. After the attack on the 5th-6th March 1916 when seventeen of its citizens were killed and fifty-two injured, the protests made by some of the odd 278,000 survivors¹ were both verbal and physical. A transport vehicle of the R.F.C. was smashed up by a noisy crowd and the city had to be pacified by the hasty installation of two 13-pounders, two 3-inch, one 12-pounder, and one 6-pounder gun, while at the same time the defences round the Humber and along the East Coast generally were strengthened.

The result was almost immediately apparent. In a raid on the 31st March the L.13 was hit above Stowmarket, and the written signal passed by its commander to the wireless operator reporting this to base was blown overboard, picked up in the fields, and sent to London. That night the R.F.C. also scored a modest success. The L.15 was hit by machine-gun fire from one aircraft and by an explosive dart from another; but the large rent in her side made by shrapnel from the ground did the real damage. She came down in the sea and the crew were taken off by an armed trawler. Further raids followed, notably one on Edinburgh on the 2nd-3rd April and in none of them did the R.F.C. or R.N.A.S. pilots have the luck to intercept. It should be pointed out—a fact only too often forgotten—that in those days they were taking very grave risks in going up at all. Not only was night flying in its infancy but the lighting of airfields left much to be desired; the aircraft were loaded with bombs which, on several occasions, exploded on landing, killing or injuring pilots, and there was the constant menace of fog. The control of aircraft by wireless from the ground had not been invented.

Into the details of the summer raids of 1916 it is not necessary

¹ The population was 278,024 in 1912.

CIVILIAN REACTIONS

to enter. By the standards of twenty-five years later they were small and ineffective. It was not until the 2nd-3rd September that the defences were at last able to suggest that airships might no longer be an effective weapon. On that night Lieutenant W. Leefe Robinson caught the wooden-framed Schutte-Lanz airship No. 11 over Essex. She was already under fire from the ground but he attacked immediately. Fortunately he was above the airship and, diving down, fired three drums of Brock and Pomeroy incendiary and explosive ammunition. When he sheered away she was ablaze and came down at Cuffley, the first enemy airship to fall on English soil. For this feat Leefe Robinson received the Victoria Cross.

On the next raid, which took place on the 23rd-24th September, two Zeppelins came to grief. The L.33, hit by gunfire and by the bullets of 2nd Lieut. A. de B. Brandon, came down in a field near Little Wigborough and was captured almost intact. The L.32 fell a victim to 2nd Lieut. F. Sowery who, according to another pilot flying close at hand, 'hosed it with a stream of fire'. It fell near Billericay.

Other airships that night attacked the Midlands, notably Nottingham, and a few days later the Mayor of that city headed a deputation representing twenty-five Midland towns, which urged that all trains should be stopped and all lights extinguished on receipt of a warning. They were informed that such a proposal was impracticable in time of war. The transport of raw materials, munitions, and food must go on. Nevertheless the speed of passenger trains was reduced to fifteen, and of goods trains to ten, miles an hour. At first the railwaymen protested but when the necessity of maintaining the service was explained to them the great majority agreed to carry on. After a century in which what fighting there was had been conducted by a professional navy and army far away from these shores, the English found it hard to understand and therefore to endure the rigours and hazards of war. The stoic courage displayed by them a generation later under trials far heavier, was in part due to this preliminary training which had not been wholly forgotten. To be wise after the event is easy, but it does not seem to have occurred to the Government of the day that the best weapon of defence lay in the hearts of the people. Had it been explained to them that this aerial bombardment put them to a certain degree in the front line and allowed them to share some of the perils facing their husbands, brothers, or sons, their attitude would not have been in doubt for a moment. Not one of their leaders, however, proclaimed that this was so and they were, therefore, confused and at times cast down. 1916 was not 1940 and there was then in power no thick-set figure, crouched over a brass-bound dispatch

‘LIKE AN ENORMOUS CHINESE LANTERN’

box in a chamber soon itself to be destroyed by the enemy's fire, to tell their elected representatives that blood, sweat, and tears must be the country's portion till victory was won.

On the night of 1st-2nd October the most resolute of the German Zeppelin commanders, Kapitanleutnant Heinrich Mathy, in command of the L.31, met his end. He had made repeated and often successful attempts to bomb London. On that occasion he was caught near the capital by 2nd Lieut. W. J. Tempest, who had taken off from North Weald about 10 p.m. He soon saw Mathy's Zeppelin about fifteen miles away, caught in a cone of searchlights, and set off immediately in pursuit, flying through the whole London barrage in, so he says in his report, 'a very inferno of bursting shells'. When five miles away his mechanical pressure pump broke and 'I had to use my hand pump. . . . This exercise at so high an altitude (he was flying at fifteen thousand feet) was very exhausting, besides occupying an arm and thus giving me "one hand less" to operate with when I commenced to fire.' Despite this disadvantage and the barrage, he held on until he got within range, when the Zeppelin, having now jettisoned her bombs, was 'mounting rapidly. I therefore decided to dive at her. . . . I accordingly gave a tremendous pump at my petrol tank and dived straight at her, firing a burst straight into her as I came. I let her have another burst as I passed under her and then banked my machine over, sat under her tail, and flying along underneath her pumped lead into her for all I was worth.' Tempest's resolution soon had its reward. 'As I was firing', he says, 'I noticed her begin to go red inside like an enormous Chinese lantern.' He had set her on fire and for a moment seemed likely to be engulfed by his victim. 'She shot up about two hundred feet, paused, and came roaring down straight on to me before I had time to get out of the way. I nose-dived for all I was worth, with the Zeppelin tearing after me. . . . I put my machine into a spin and just managed to corkscrew out of the way as she shot past me roaring like a furnace.' Tempest watched the L.31 strike the ground in a shower of sparks and 'then proceeded to fire off dozens of green Very lights in the exuberance of my feelings'. The Zeppelin fell at Potters Bar.

The last airship raid of 1916 occurred on the night of the 27th-28th November when the L.34 was shot down by 2nd Lieut. I. V. Pyott. It fell into the sea at the mouth of the Tees. A similar fate overtook the L.21, which, driven away by gunfire from Leeds, was eventually caught by Lieutenant W. R. Gayner near East Dereham in Norfolk. His engine failed before he could close her, but shortly afterwards she became the victim of a naval pilot, Flight Sub-Lieutenant E. L. Pulling.

Thus by the end of 1916 the R.F.C., the R.N.A.S., and the

‘AND THEY WERE SCATTERED’

ground defences had got the measure of the Zeppelins and this was soon recognized by the enemy who, for the last two of the Four Years War, greatly reduced the number of airship attacks. In 1916 there had been twenty-two Zeppelin raids; in 1917 there were seven, and in 1918 only four, one of which never crossed the coast.

During the lull in the winter of 1916-17 our aircraft defences were reduced, for the R.F.C. in France was urgently in need of night-flying squadrons and it was decided to supply the pilots for two of these from the Home Defence Wing. Similar steps were taken to cut down the ground defences, French issuing an order on the 7th March 1917 restricting the fire of anti-aircraft guns to that of those in the coastal areas. The object of this order was to free more trained gunners for service in France.

The Germans, however, had not abandoned all faith in their airships. On the 16th March five naval Zeppelins were sent to bomb London and southern England. They were met this time by the forces of nature rather than those of man. A forty mile an hour wind which got up shortly after their take-off rendered their mission hazardous. The L.39, whose captain had been unwise enough to stop his engines, drifted helpless over France for they had become frozen and his ship was eventually destroyed by French gunners. This was their only casualty, but the next German attack on the night of the 23rd-24th May was equally unsuccessful. In an endeavour to intercept one of the Zeppelins taking part in that raid, a naval pilot flying a Sopwith seaplane fell into the sea but was found by a ship and towed into port. Another pilot from the same flight, Flight Sub-Lieutenant Morris, with his observer Air Mechanic, G. O. Wright, went out to look for him and was forced down into the North Sea by engine failure. The two airmen clung to the remains of their machine for five and a half days, subsisting on a few malted milk tablets. They were eventually rescued by a flying-boat from Felixstowe.

On the next Zeppelin raid, on the night 16th-17th June, the L.48 met her end at the hands of Captain R. H. M. S. Saundby and Lieutenant L. P. Watkins. It fell near Theberton in Suffolk and its crew were buried in the local churchyard, upon their grave being inscribed the text: ‘Who art thou who judges another man’s servant? To his own master he standeth or falleth.’

It was, however, on the night of the 19th-20th October that the Zeppelins suffered their greatest disaster of the war. Eleven naval Zeppelins attacked this country in curious weather conditions. Up to ten thousand feet the winds were light, but above that height they were blowing at forty miles an hour, and at twenty thousand feet a full gale. The Zeppelins started at a comparatively low altitude but, in order to reduce the risk of aeroplane attack,

THE END OF THE ZEPPELINS

gained height as they neared the English coast. They at once found themselves in the grip of the gale. Four of them, the L.44, 45, 49, and 50, never saw Germany again. The first, after dropping bombs which just missed an ammunition dump between Elstow and Kempton, drifted across France, was hit by anti-aircraft fire and destroyed. The second, the L.45, had a curious fate. She left Tondern at 11.25 a.m. on the 19th October and crashed near Sisteron in southern France at 10 a.m. on the 20th having, among other feats, dropped a bomb on Piccadilly Circus. The L.50 followed closely in the track of her ill-fated colleague. Driven southward by the high wind, she made an effort to land about midday near the trenches in France. Being fired at, she made off, came down again, and grazed the top of a wood, losing her forward car with its crew. Thus lightened, she shot upwards and disappeared. She later passed over the crew of the L.45 who were by then prisoners of war at Sisteron, then went out to sea pursued by French pilots and was finally lost to sight and knowledge far out over the Mediterranean. The L.49 also drifted over France and was forced down near Neufchateau and captured intact. Once again the elements had come to our help for not one of the seventy-three pilots who went up against the Zeppelins that night was able to reach them at the height at which they flew.

That was the last Zeppelin raid of 1917. Of the four which took place in 1918, only the last needs mention. It was abortive for no bombs fell on England, but in it Fregatten-Kapitan Peter Strasser, the moving spirit of the Naval Zeppelin Service, met his death. His airship, the L.70, was shot down some forty miles off Yarmouth by Major E. Cadbury and Captain R. Leckie, being completely consumed by fire in less than a minute. Had not Leckie's gun jammed, one of Strasser's two consorts would have met a like fate. Indeed the British officers thought that they had set her on fire, for a bright light glowed for a moment and was then abruptly extinguished. A member of the Zeppelin's crew had twitched back a black-out curtain in the gondola.

Such was the end of the Zeppelins. They had been mastered as much by the weather as by the defence, for, though a high proportion were shot down, yet had they been able to make better use of their climbing powers, they might, at any rate in the later stages of the war, have out-manœuvred the defence for there was no aeroplane capable of reaching their ceiling. As it was, the results that they achieved in fifty-one raids, during which they dropped 196 tons of bombs, were not commensurate with the great efforts made; but 557 persons were killed and 1,358 injured.

A far greater menace were the German long-range aircraft, whose attacks must now be considered. At first they were mild

enough. On Christmas Eve of 1914 a raid was made on Dover, and one the next day on the Thames, a total of three bombs being dropped. In 1915 German aeroplanes were over this country on only three occasions; nor were their attacks very numerous in 1916, eleven out of nineteen being made on Dover, while Folkestone, Broadstairs, Margate, and Sheerness came in for some slight attention. Altogether in the first two and a half years of the Four Years War our casualties were no more than twenty persons killed and sixty-seven injured at a cost to the enemy of two seaplanes and two land planes. The only attack of more than passing interest was that made on London on the morning of the 28th November 1916, and that only because it was the first time a heavier-than-air machine had succeeded in bombing the metropolis. Deck-Offizier Paul Brandt with Leutnant Walther Ilges as his observer, in an L.V.G. powered by a 225 h.p. Mercedes engine, sought to bomb the Admiralty in Whitehall. Their aim was not very accurate and their six 10 kilogramme bombs fell between the Brompton Road and Victoria Station. On the way home engine trouble forced them to alight near Boulogne where they were captured.

It was not until 1917 that the German High Command made a determined effort to use the aeroplane to attack this country. After the autumn of 1916, the G.O.C. of the German Military Air Service had reached the conclusion that airship raids on London had become too costly and, therefore, impossible. He urged that, since by the 1st February 1917 the Gotha G. IV. type of aircraft would become operational, as many as possible should be used to bomb London. Eighteen of these aeroplanes could, he pointed out, carry the same weight of bombs as three airships and 'so far three airships have never reached London simultaneously'. It was not, however, until the 25th May 1917 that the difficulties of preparation had been surmounted and that the weather proved favourable. On that day twenty-three Gothas started and twenty-one crossed our coasts. Thick cloud caused them to turn back before reaching London and to drop their bombs in Kent, mostly among Canadian soldiers at Shorncliffe camp, and women and children shopping in Tontine Street, Folkestone. Determined but not very successful attempts to intercept them were made by thirty-seven pilots of the R.N.A.S. and the R.F.C., but the fighters based on Dunkirk had greater success for they destroyed one Gotha and damaged another.

The attack is memorable because it showed conclusively how totally inadequate were our defences. The country was stirred, especially the town of Folkestone which had to mourn the deaths of thirty-one women and twenty-five children, and a conference presided over by the Chief of the Imperial General Staff was

FOURTEEN GOTHAS REACHED LONDON

hastily summoned. It concluded that the area vulnerable to Gotha attack stretched from Southwold in the north to Rottingdean in the south, and as far inland as Bury St. Edmunds and Brentford. A number of anti-aircraft N.C.O.s and men were put on board the seven lightships in the Thames Estuary and off the East Coast with orders to open fire immediately, and the air patrols were strengthened. Few, if any, regarded these measures as adequate. As has already been said, our home defences were being deprived at that time of pilots and observers in order to build up a force of night-flying squadrons with the R.F.C. in France, and the position, therefore, from French's point of view, was highly unsatisfactory. He was swift to point out that 'the object for which the Home Defence Wing was originally constituted appears in danger of being lost sight of', and he went so far as to maintain that the air defence was so inadequate 'that a continuance of the present policy may have disastrous results'. His letter to the War Office was dated the 5th June and its arguments were strongly supported by the enemy, for at five past six on that evening twenty-two Gothas attacked Shoeburyness and Sheerness. One of them was destroyed by anti-aircraft fire, but of the sixty-five pilots who went up to engage them, only five got within range and that for too short a time to inflict any damage on the raiders.

French's letter was not a week old when the Gothas succeeded in their third attempt to reach London. Fourteen of them, led by the commander of the squadron, Hauptmann Brandenburg, and flying in a diamond formation, were over the capital at 11.35 a.m. on Wednesday, the 13th June. They dropped 118 bombs, killed 162 persons and injured 426. 'The visibility was exceptionally good,' said Brandenburg in his report. 'With perfect clearness the Thames bridges, the railway stations, the City, even the Bank of England could be recognized. . . . Our aircraft circled round and dropped their bombs with no hurry or trouble. . . . It can be said that the majority fell among the docks and among the City warehouses. . . . All the aeroplanes landed safely on their aerodromes.' Though inaccurate in his estimate of where the bombs were dropped (seventy-two of them fell within a radius of a mile from Liverpool Street station), the rest of his report gave a very fair summary of the facts. The defence had been completely mastered. Of the ninety-two British pilots who went up to attack the Gothas, very few got within range and only one, a Bristol fighter, delivered an attack. Its observer was killed.

Public indignation was very great. The War Cabinet met in a hurry, and in principle approved the doubling of the air services. To take such a decision, however, was one thing; to implement it quite another, and in the meantime immediate measures were

THE ENEMY'S MAIN OBJECT

urgently necessary. Appealed to by Haig, Trenchard pointed to the obvious but very difficult remedy. If the Belgian coast could be recaptured, such raids would be very costly to the enemy and would soon become impossible. Failing that, their bases should be bombed by such aircraft as were available. What could not be done was to establish a system of continuous patrols, for 'the number of machines and pilots required would be entirely beyond our present power of supply'. Trenchard went on to emphasize what was undoubtedly true, that the main object of the enemy was to weaken the R.F.C. in France by causing the withdrawal of fighter squadrons to defend London. There was one remedy, or rather antidote, which he suggested with great diffidence. 'Reprisals on open towns', he said, 'are repugnant to British ideas but we may be forced to adopt them', and he went on to urge that, if this policy were to be pursued, it must be so to the bitter end; half measures with the Germans were useless.

Exactly what was meant by open towns was not certain. The capital of a great nation at war can scarcely be described as an open town when it houses, as did London, all the machinery of government and many of the staff directing operations both on sea and on land. There is not the slightest doubt that we would have bombed Berlin at that moment had we had the means to do so. But twenty-eight years ago 'total war' was a phrase unknown save to a few students of German psychology, and it is very doubtful if any one in those days would have been bold enough to disagree with the Press whose agitation was extreme. In this is certainly reflected public opinion, which was soon to reach a condition perilously near boiling-point.

Both Haig and Trenchard put their views before the Cabinet at a meeting held on the 20th June. After a long discussion the Commander-in-Chief was forced with great reluctance to agree to the dispatch of two fighter squadrons, No. 56 flying S.E.5s and No. 66 flying Sopwith Pups, the first to Bekebourne near Canterbury, the second to Calais. It was hoped that they would provide any subsequent daylight raiders with an unpleasant surprise, but to do so the R.F.C. had been grievously weakened at the very moment when the Passchendaele offensive was at its height. Lieut.-Colonel M. St. L. Simon, R.E., the anti-aircraft defence commander of London, must have smiled that day a trifle wryly when French, his chief, told him of this decision. For months he had been urging the necessity of setting up guns to meet possible aeroplane attacks by fire from the ground but he had 'received neither encouragement nor assistance in the preparation even of an emergency scheme'. A fortnight before the arrival of the two squadrons he had issued his long prepared plan, but it was still largely on paper.

FAILURE OF THE DEFENCES

The difficulties of providing for the defence of London had been far from solved by the recall of these two fighter squadrons. On the 4th July another daylight attack developed but got no nearer the City than Harwich and Felixstowe, where damage was done to the Royal Naval Air Station. The returning Gothas might very easily have been intercepted by No. 66 Squadron waiting at Calais for just that purpose, but, for some unexplained reason, it received no warning until it was too late for its eager and highly skilled pilots to attack the raiders. On the next two days both squadrons were sent back to duty behind the lines in Flanders, and a few hours after the last of their machines had touched down, the Gothas were once more over London. On the morning of the 7th twenty-two of them set out. One turned back with engine trouble, and bombed Margate on the way home; but the rest passed across the City and the East End, dropping bombs as they went. The organized defences failed utterly, though there were a number of combats between the R.N.A.S., the R.F.C., and the Gothas on their return journey, as the result of which one of the enemy was shot down in combat and four crashed on landing. It is probable, however, that this was due not to damage received in action but to a high wind which was blowing at the time.

The effect on public opinion of this daylight raid was very great. Neither the flying services nor the anti-aircraft defence had been able to prevent the Germans from flying over the heart of the capital and dropping bombs with almost complete impunity. In an atmosphere of excitement amounting almost to panic the Cabinet met that same afternoon. It was a Saturday, and ministers on their hasty way to Downing Street had ample evidence of the general public's indignation. Sir William Robertson, Chief of the Imperial General Staff, who was present, has left it on record that the agitation displayed at the Cabinet meeting itself was such that 'one would have thought the whole world was coming to an end'. In a letter written two days later to Haig he vividly describes the scene. 'I could not', he says, 'get in a word edge-ways. French was there and gave a long story as to his insufficient forces, and made a great protest because the two squadrons you had lent him were taken away. In spite of all I could say, the decision come to was that you were to send two squadrons to England till the Cabinet choose to release them. There is no doubt that French has not got a very good force. It is mainly made up of oddments, and of course oddments will not do.'

Robertson was indeed right, but the Cabinet was in a quandary. To weaken the R.F.C. in France was to play the enemy's game, but on the other hand machines and pilots in England were not available in adequate numbers. The Government must have been well aware of this for some time, for Robertson had raised the

A NEW DEFENCE SCHEME

matter on no less than six occasions since the beginning of the war. He did so again that Saturday afternoon and members of the War Cabinet complained bitterly when they learnt for the first time that a week previously French had written to Robertson informing him that he had at his disposal only twenty-one efficient fighters. The wrangling in the Cabinet was of more than academic interest, for out of it sprang not only a reorganization of the defences, carried out by a small committee of which the dominant figure was that great South African, Smuts, but also eventually the creation of the Royal Air Force.

While Smuts's committee was getting under way, one squadron, No. 46, flying Sopwith Pups, was recalled from France and stationed at Suttons Farm, Essex. Fortunately the enemy made no further raids for a fortnight, and during the respite the committee had time to formulate a scheme of defence of which the principle was a combination of barrage fire from the ground and of attacks by fighter aircraft in the air. Both were designed to break up the hostile formations and then destroy the Gothas one by one. All the anti-aircraft fixed and mobile defences, all the R.F.C. squadrons, numbering at first only six, and all the observer corps posts from Grantham to Portsmouth were put under one man, Brigadier-General E. B. Ashmore, who assumed command on the 15th August. One of his first actions was to put Simon's artillery defence plan into operation. A system of giving warnings to the public of air raids by the firing of maroons was instituted and, on receipt of information that an attack was imminent, constables were instructed to patrol the streets on foot, on bicycles, and in motor-cars, carrying placards inscribed with the words 'Take Cover'.

As far as the daylight hours were concerned, these precautions were unnecessary, for London was not again attacked between dawn and sunset, the enemy reserving his efforts for moonlight nights. The Harwich district, Essex, and Kent continued to receive spasmodic attention by day, the last attack being made on Ramsgate on the 22nd August, when three Gothas were brought down, two by gunfire and the other by Flight Sub-Lieutenant J. Drake, of the R.N.A.S. By then the German High Command were beginning to fear heavy casualties and these, considering the comparatively small size of their bomber force, they could not accept. The switch-over from day to night 'was due', says Major von Bülow, 'to no abatement of the fighting spirit of the squadron but must be ascribed to technical reasons and to the improvement in the British anti-aircraft defences'.

The moonlight campaign started, as had the daylight, with an attack on Dover carried out on Sunday, 2nd September 1917. Altogether twenty-one were delivered between that day and the

BALLOON APRONS AND NIGHT FIGHTERS

end of the war. The objective was in every case London, but it was not always reached. To meet these attacks our defences made use of various devices, of which the chief was an apron of steel wire suspended in the air from captive balloons. The idea had been borrowed from a similar method of defence used by the Italians to protect Venice. It was intended to erect twenty such aprons round London and nine of them were in position by the 27th May 1918. The maximum height of their upper edge was 9,500 feet. Height-finding instruments and sound locators, both primitive by the standards of the next generation, were also installed to help the guns. All this, however, took time, and in the meantime London and East Kent suffered, notably on the 29th-30th September and 1st October.

Though the casualties caused by these raids were very small in comparison with the size of the population, their psychological effect was considerable. Winston Churchill, who had become Minister of Munitions in July 1917, reported to the Cabinet at the end of September that in Woolwich Arsenal only 27 per cent of workers engaged on the production of small arms ammunition had reported for duty on the day after the raid of the 24th-25th September, and only 64 per cent on the next day. By that time, too, the anti-aircraft guns were in bad shape for they had fired far more than the maximum number of rounds—fifteen hundred—which constituted their 'life'. Trenchard was sent for from France and it was decided to organize raids on Germany as a form of reprisal. They were to be carried out by Handley Pages and D.H.4s from an aerodrome near Nancy.

Throughout these German moonlight attacks our night fighter pilots were doing their best, but were handicapped not only by the difficulties of time and weather but also by the inferiority of their machines. The Gothas and their companions, the Giants, were formidable aircraft for those days, with considerable speed and good powers of climb even when loaded. On the night of 29-30th January 1918, for example, two Giants were over London at a height of not less than twelve thousand feet. Gradually, however, as conditions improved, our fighter pilots began to reap the reward for hours of patience and danger, roaring through the night between dark sky and darker earth. By 1918 they were flying better aircraft—Sopwith Camels fitted with 110 h.p. Clerget engines. On raid nights they would take off from airfields lit by two-gallon petrol tins half filled with cotton waste soaked with paraffin. This somewhat primitive form of illumination was disposed in the shape of an L, the long arm pointing into the wind and the short to the limit past which the machine should not run after landing. Once in the air they had what was then a unique vision of the world they had temporarily quitted. The passing

'A FLY IN A DARK ROOM'

train looked 'like a golden snake with a long white ostrich feather', and London like 'a dark, crouching monster' leaning upon an earth which took 'the moonlight like a cloak of moleskin'. Suddenly the solitary airman, crouched in his open cockpit, would see flashes of anti-aircraft shell bursts 'like yellow, low-hung stars' far away on the horizon. 'I was now all eyes,' records Cecil Lewis, 'peering through the night trying to spot the black silhouette of an enemy, but it was futile; like trying to see a fly in a dark room. Soon the barrage grew heavier: thirty or forty batteries on both banks of the river were speaking; pin-points of greenish-gold on the ground, and after about fifteen seconds a smoky yellow flash . . . in the sky. . . . The searchlights were wheeling and flickering excitedly like the antennae of monstrous butterflies. . . .'

The last night aeroplane raid took place on the 19th-20th May 1918, and this time the enemy was made to pay dearly. Forty-three Gothas and Giants were sent to attack London but not more than nineteen, and probably only thirteen, got there. The anti-aircraft defence, which fired thirty thousand shells, and the eighty-four night-flying aircraft which went up destroyed between them six bombers, while a seventh crashed with engine trouble in Clacton, and an eighth in Belgium. The Germans never attacked this country again.

This was the last air attack on this country for twenty-one years. Altogether the German bombing aircraft had dropped 73 tons in fifty-two raids, killed 857 persons and injured 2,058. That was the material result. Another was far more important and far-reaching. The raids, by throwing into sharp relief the inadequacy of our defences, helped in no small measure to bring into being the Royal Air Force.

14. R.F.C. + R.N.A.S. = R.A.F.

IT is now necessary to consider the events at home which led to the creation of the Royal Air Force. Before doing so, however, a word must first be said concerning the supply and equipment of aircraft, for the troubles, delays, and vexations met with in coping with a problem destined to grow ever more and more urgent as the war progressed, were one of the many goads which eventually drove a reluctant Government to take a step long seen by keen and unbiased eyes to be inevitable. In considering the problem of supply, an essential feature of air warfare must always be borne in mind. It is the extreme rapidity with which its development has been marked from the very beginning. Unlike warships and other weapons of war, though the designing and testing of them may take months or even years, aeroplanes take very little time to build. In the Four Years War, if one particular type proved unsatisfactory, its place in the field could be, and was, taken by a different type in a very few months. Each side had, therefore, to pay an almost exaggerated attention to aircraft design. First one then the other would produce a faster fighter or a heavier bomber which secured a temporary, if fleeting, supremacy. Numbers were not of such supreme account, for an aeroplane with a superior turn of speed and with heavier and more effective armament could overcome several less capable machines. No one realized this better than Trenchard. It was his duty to produce a series of programmes for the expansion of the Royal Flying Corps which would take account, not only of the possible changes in the German air service, but also of the needs, in so far as the air was concerned, of the British armies in France. It says much for his foresight that, despite postponement and disappointment, his programmes stood up to that most exacting of all tests, trial on the field of battle, and there is not much doubt that, could they have been fulfilled to the utmost limit, they would have ensured the continuous superiority of the R.F.C. Having regard, however, to the condition of the aircraft industry and to the mentality of the Whitehall warriors of the day, that would have been a miracle.

Nevertheless his labours were ultimately crowned with a very great measure of success. Even before the battle of the Somme he had asked that the number of squadrons in France should reach fifty-six before the spring of 1917 and, as has already been recorded, by September of that year he had urged that twice as many fighting squadrons as there were artillery co-operation squadrons should be provided. His request, strongly supported

THE BUILDING OF AIRCRAFT

by the British Commander-in-Chief, raised the problem of equipment in an acute form. The original establishment for a squadron of twelve aircraft had included six heavy and seven light tenders and seventeen other vehicles, in which to carry a heterogeneous collection of stores varying from copper tubing to fire extinguishers. After two years of combat, by which time the strength of a squadron was eighteen, not twelve machines, far more equipment than this was needed. There was, also, the ever-present problem of wastage to be dealt with. Only eighty-four replacements had been made in 1914, but this number had been more than quadrupled in the following year, while in 1916 the number had been 1,782, all these aircraft, of course, being additional to those which had originally made up the strength of each squadron. They had to be designed and built by an industry which, up to the outbreak of war, had been in the position of an underfed and neglected child. In August 1914 only twelve firms in all England were in a position to manufacture aircraft, and of these three were devoting themselves almost entirely to the production of seaplanes. In addition there were two ordnance firms building aeroplanes to Government design. The total rate of output from all sources was not higher than a hundred aircraft a year.

The French were of assistance to a certain extent, and three of their types were put into production to add to those of the Sopwith, Bristol, and Martinsyde firms which, together with the Royal Aircraft Factory, were called upon to turn out all that was needed. Aircraft supplies were controlled by the War Office, which had a Military Aeronautics Directorate under the command of David Henderson. In it is to be found the origin of the Air Ministry, for it was a semi-independent body with the right to make its own contracts with outside firms. The R.N.A.S. was dealt with on strictly naval lines and was not directly represented on the Board of Admiralty. The factory at Farnborough served as a technical organization available to both Services.

At the outset a certain degree of co-ordination and co-operation had been achieved by the Joint Air Committee, but, on the outbreak of war, just when its services might have proved of high value, it ceased to exist. As long as it was merely a question of developing existing means of production its disappearance was of no great consequence, for the needs of the two branches of the air service differed considerably. In engines, for example, what was needed for the R.N.A.S. was a large, water-cooled type, and this the firms of Rolls-Royce and Sunbeam undertook to deliver. In addition the Admiralty bought engines and spare parts wherever it could find them. The War Office, however, though employing the firm of Napier to a certain extent, shewed a

DIFFICULTIES OF SUPPLY

tendency to rely on the services of the Royal Aircraft Factory. This institution, which had originally been established as an experimental station, soon came under heavy fire from private manufacturers, who accused it of trying to steal their designs. Thus almost from the beginning, lack of planning, rivalry, and the private citizen's innate suspicion of any Government undertaking, created grave difficulties of supply.

The War Office placed orders haphazard for Avros, Farmans, and Blériots, and went so far as to order the Vickers fighter in considerable numbers, though its performance was unknown and it was doubtful whether its 100 horse-power Monosoupape-Gnome engine was either available or reliable. The factory at Farnborough secured the standardization of the B.E.2c, large numbers of which were put into production. It also busied itself with designing other aircraft such as the S.E.2 and the S.E.4, both fighters, while private firms concerned themselves with the design and production of single-seaters, and later on of bombers. As might have been expected, confusion was the net result of all this unco-ordinated effort, nor was the country spared the unseemly spectacle of the Admiralty and the War Office competing against each other in their efforts to secure adequate quantities of a weapon vital to her safety.

French help only added to the difficulties, for French manufacturers were as short of certain essential materials, such as aeroplane cable and ball bearings, as were British, and could only be induced to fulfil the orders placed with them by a process of bargaining in which it is hard not to detect the essential features of blackmail and bribery. In June 1915, for example, the French Government intimated through Joffre that it was their intention to stop all aircraft supplies unless they received in return Lewis guns to a number amounting to 15 per cent of the entire production in Britain of those weapons. A few months later, when the capacities of the 110 h.p. Le Rhône engine had been proved, out of one hundred and fifty asked for by the British Government to power the Morane Bullet, the Morane Parasol, and the Nieuport Scout, all three of them French aircraft then in use by the R.F.C., only twenty-four were allotted and but ten actually delivered. In its defence it must not be forgotten that the French aircraft industry was in danger of being overwhelmed, for it had to supply not only the needs of the air force of its own country but had also to build machines for Britain, Russia, and Italy.

The most difficult problem, however, was always the problem of engines, and the mistakes made in trying to cope with it were such that, even when victory had been achieved, it was still unsolved. The satisfaction of every demand for an increase in the flying services depended ultimately on the supply of engines.

OUTPUT OF ENGINES

Despite a prize of £5,000 offered by the Government in the spring of 1914, no satisfactory aeroplane engine had been produced by August 1914. Not only that, but magnetos, a vital part of the internal combustion engine of those days, were for a long time very scarce, for Germany was the principal producer of them. By the end of 1916, not more than thirty British-made magnetos a week were available for aircraft. Efforts made in 1915 to obtain engines from France failed, and it was then that firms like Rolls-Royce and Napier stepped in to save the situation. Rolls, it will be remembered, had lost his life in a flying accident in 1910; Royce, though a confirmed invalid—for many years a nurse was in constant attendance on him—was a mechanical genius of the highest order. To him and to his assistants were due the Eagle, Falcon, and Hawk engines of 1915 and the more powerful models which succeeded them. By December 1916 the output of engines was only six hundred a month, though the total approved number of service squadrons for the Royal Flying Corps alone was one hundred and six, and to keep these fully operational eight thousand up-to-date engines were required. A programme by which two thousand a month would be forthcoming was adopted in January 1917, but it was realized that many months would have to elapse before decisions on paper became facts in the air. To tide over the intervening period resort was made to a number of expedients, most of which were disastrous.

Experts serving on the Internal Combustion Engine Subcommittee of the Advisory Committee for Aeronautics, began by recommending the immediate production of an eight-cylinder engine, later known as the Sunbeam Arab, and three thousand were ordered, despite a warning that the engine was quite untried, and that many of its parts, being of aluminium, would probably prove difficult to cast satisfactorily. These orders immediately absorbed the full capacity of production of two large firms, one British, the other American, and when the engine appeared in May 1917, its aluminium cylinders and crank chambers proved, as had been feared by the prescient, quite unequal to the strain put upon them. The engine was indeed entirely useless. The experts had gambled and lost. To incur the risk of producing an untested engine in large quantities is unjustifiable in time of peace; in time of war it is little short of criminal.

The Sunbeam engine was, however, only the first of several failures. The 200-h.p. Hispano-Suiza under manufacture by the Wolseley Company was at first equally unsuccessful. At a bench test one engine broke four crankshafts in succession in four hours. Modifications and improvements were hastily improvised, but by the end of August 1917 only ten out of one hundred and forty had been delivered, with the very serious consequence that none of

CONFUSION AND INCOMPETENCE

the R.E.8 squadrons in France could be re-equipped with Bristol fighters for many months, and did not, in fact, receive these aircraft until September 1918. The result was that almost until the end of the war many R.F.C., and later R.A.F., pilots were forced to fly a machine in which few had complete confidence. Compared with this blunder, the fact that, owing to production failures, four hundred new S.E.5 machines were, for lack of engines, still in store in January 1918, must be considered a minor misfortune.

The B.H.P. engines, of which two thousand were to be produced by the Siddeley Deasy Company, were in their early stages as inefficient as the rest: 90 per cent of one batch of cylinder blocks were found to be defective. It is impossible not to come to the conclusion that rashness and wishful thinking, combined with technical difficulties, inevitable when a new weapon is in process of development, caused the loss of many valuable lives. Things reached such a pass, in fact, that in October 1917 French engines of admittedly poor quality—the gear wheels were unevenly case-hardened—were installed in aircraft, since the authorities seem to have held the view that a bad engine was better than none. They sought to salve their consciences by frankly admitting this defect, which was recorded in the log-book issued with each engine, together with a recommendation that its running should be carefully watched. The feelings of pilots called upon to take machines fitted with them into the air and having done so to challenge von Richthofen, if necessary, are better imagined than described. It was a shocking, an indefensible decision.

Amid this welter of confusion and incompetence, when engines were found to be too big for air-frames and vice versa, when so-called experts chose the wrong engines not once but every time,¹ the Admiralty and the firm of Rolls-Royce stood out like twin rocks. At the end of 1916 the Naval Staff insisted that eight thousand engines of a later and a reliable Hispano-Suiza model should be constructed by the Mayen Company of France in factories specially erected for the purpose. They secured the adoption of this programme despite the gloomy prognostications of Lord Curzon, who took the view that every country including Britain would be so exhausted by the end of 1917 that the war would have petered out in which case 'to be left with a large number of aeroplanes would be highly inconvenient'. The fruits of this wise naval decision became apparent in 1918, when such foresight had its just reward. The firm of Rolls-Royce, encouraged by the Admiralty and hampered by constant official interference with their supply of workmen, machine-tools, and material,

¹ The Sunbeam Arab, the early Hispano-Suiza, the B.H.P., the Dragonfly, and the Liberty, were in turn hailed by the experts as the answer to the airman's prayer for a reliable engine. For a long time all were failures.

A MEMORANDUM FROM SMUTS

steadily produced ever increasingly satisfactory engines, though even they could not reach as high a production figure as had been hoped. Nevertheless the firm had made 6,554 admirably efficient engines by the end of the war.

It must not be supposed that throughout this time the Government remained in ignorance of the situation. It did not. The German daylight raid on London of the 13th June 1917 caused it to double the air services on paper; how to do so in the air had to be made the subject of an urgent inquiry which was carried out by Lieut.-General Jan Christiaan Smuts. On the 18th September his memorandum on the matter administered a sharp shock to the Cabinet, which had been cherishing the belief that by 1918 there would be a surplus both of aircraft and of engines. They were now told that not even the limited programme of expansion put forward by Trenchard in 1916 and blithely doubled by the Government six months later was in process of execution. 'I consider,' said Smuts, 'that the Cabinet have really no option, but must give the fullest and most complete priorities necessary not only to carry it [the smaller programme] into effect, but even to accelerate it. If this is not done we will run risks which may well prove disastrous.' Appalled, the Cabinet agreed and set up the War Priorities Committee which will be referred to in a moment.

During the first fourteen months of the Four Years War the British people remained in a condition of uneasy ignorance as to the state of affairs in the air services. When, however, the enemy began with his Fokkers to achieve mastery in the air, public opinion was stirred and demands were made in Parliament for the appointment of an Air Minister to be in full control. The reaction of Whitehall was classic and immediate. On the 15th February 1916 a permanent Joint War Air Committee was established to ensure collaboration and co-ordination. It lasted less than two months. The naval representatives upon it, not being members of the Board of Admiralty, could agree to nothing without reference to that supreme body in naval affairs; moreover, since the Committee had no executive powers, it had no authority. This was pointed out with some firmness by the chairman, Lord Derby, in his letter of resignation of the 3rd April, and David Henderson hit the nail on the head when he suggested that close co-operation could only be secured by 'closer fusion of the two supply departments'. The corpse of the dead committee was afforded the honour of a post-mortem at the hands of no less a person than Lord Curzon. The brilliant mind of the Lord President of the Council analysed its shortcomings and went so far as to suggest that an Air Board should be created as a preliminary to the establishment of an Air Ministry. He even hinted that a separate

ADMIRALTY VERSUS AIR BOARD

air service might be the best solution. His memorandum provoked Lord Kitchener into expressing the opinion that, valuable though the Board might be, its decisions must not be allowed to bind the Board of Admiralty nor the Army Council, which would still remain free to decide questions of policy, while Mr. Balfour, for the Senior Service, maintained that 'a fighting department should, as far as possible, have the whole responsibility . . . of the instruments it uses, the personnel it commands and the operations which it undertakes . . . the Navy should not have to consult any outside department . . . it should be autonomous'. After delivering this broadside, however, he was careful to add that 'some dramatic change may be forced on them [the Government] by the House of Commons'.

He had correctly diagnosed the feeling both in Parliament and in the country. On the 11th May 1916 an Air Board was established and given wider powers than the Joint War Air Committee. Once again, however, it was not granted executive authority, and though its chairman, Curzon, took a very wide view of its duties, and though the naval representative upon it was the Third Sea Lord, and the military the Director-General of Military Aeronautics, it was soon almost as impotent as its predecessor. While Curzon was fighting the newly created Ministry of Munitions over a demand for absolute priority for machine-tools used in aircraft construction, public outcry was being directed against the Royal Aircraft Factory at Farnborough. A Committee of Inquiry under Mr. Justice Bailhache sat through the early summer of 1916, and, though praising the factory for its work in the field of design, was critical of the manner in which questions of supply had been handled. So was Curzon. Hardly had the Bailhache Committee made its first report in August when he learnt that the Admiralty had, without reference to the Air Board, obtained Treasury sanction to spend some three million pounds on aircraft and engines. A formal protest was met by a formal denial of the Board's right to protest, and by October there was an open breach. It remained for *The Times* to put forward the views of the general public. This it did on the 24th October 1916, in a leading article in which it pointed out that the Air Board's powers were insufficient and urged the appointment of an Air Minister.

Meanwhile Balfour had returned to the attack, delivering a fierce reply to a long report sent by the Air Board to the Cabinet. In this it had once again been urged that there should be one supply department responsible to the Board and to the Board alone, that the Board should be supreme in all matters of supply, design, and finance, and, finally, that the Royal Naval Air Service should be put under one single officer who should be a member

BATTLES IN WHITEHALL

of the Board. The effect of this last proposal would have been to put this Service on a footing equal to that of the R.F.C. Balfour's comments on these suggestions made it clear that the Admiralty regarded the Air Board as a hostile department with 'the right to criticize, the power to embarrass, but with no direct responsibility for military or naval action', and that, though their lordships might possibly consent to a unified air supply department, they would never agree to a system under which they did not have full control of the number and design of the aircraft to be used with the Fleet.

The position now seemed hopeless. Curzon and Balfour, actuated, as they would have maintained, by motives of the loftiest patriotism, were in opposite camps. The prestige of both of them was high, for they were among the greatest figures of their day. Behemoth was ranged against Leviathan and Whitehall held its breath. As if this were not enough, another apple of discord was flung down, this time by Colonel Barés, representing the French Air Service, who urged the vital importance of long-range bombing. The Admiralty became intrigued by this idea, and since the only force capable of carrying it out was the Royal Naval Air Service from its base at Dunkirk, urged the immediate provision of a thousand engines to maintain two hundred aircraft for the purpose. It was now the turn of Haig to protest, and he did so in no unmeasured terms. If the naval authorities, he said, were to interfere with the supply of aircraft to the R.F.C. by absorbing all the available engines, then the success of his land operations would be compromised. Until he had a number of aircraft large enough to meet all the requirements of the armies in the field, the bombing of Germany must be regarded as a luxury. To drive home this point he put forward his demand for twenty extra fighter squadrons.

It was at this juncture, November 1916, that the Asquith Government fell and a new Government under Lloyd George, with a small War Cabinet, took office. It at once widened the powers of the Air Board and transferred the responsibility for the design and supply of aircraft from the Admiralty and the War Office to the Ministry of Munitions. The Board's membership was also changed, and on the 6th February 1917 a new Board under Lord Cowdray took office. It was virtually the beginning of the Air Ministry, for it soon acquired a considerable staff which was housed in the Hotel Cecil, together with the Aeronautical Department of the Ministry of Munitions. By one of those unofficial but perfectly satisfactory agreements which are a feature of English life, the two bodies worked amicably together and became in effect a Ministry of Aircraft Supply. By then, however, much valuable time had been lost, and the effect of the quarrels

and muddles in Whitehall was seen only too clearly in the spring of 1917.

The position of the Royal Flying Corps became acute before three months were out, and it had to pay in heavy losses both in men and machines for the futile bickerings of the previous year. Faced with an eloquent appeal made by Trenchard on behalf of Haig, the Admiralty with that good sense and statesmanship with which its centuries of existence have endowed it, placed at the R.F.C.'s immediate disposal four additional squadrons, fifty-five Rolls-Royce engines and sixty Spad aeroplanes; but even with this timely aid, on the 9th April 1917 there were no more than fifty squadrons available in France, in place of the fifty-seven asked for. Of these, twenty-one were Corps, twenty-seven fighter and two bomber squadrons. Whether the Four Years War would have been shortened and much misery and loss of life avoided had those in authority shewn as much eagerness to fight the common enemy as they displayed in fighting each other, is an interesting, if unprofitable, speculation. The position of the air-men in the field was clear enough. They had to combat a resolute and well-armed enemy, and in so doing they risked not their reputations but their lives.

It needed, however, more than high casualties among the R.F.C. to convince the Government that a victory in Whitehall was a poor substitute for one in France. In the spring and early summer of 1917, while Cowdray was still struggling in the Hotel Cecil to overcome the many troubles confronting the Air Board, the War Office, less than half a mile away, was debating how best to expand the R.F.C. On the 21st June it recommended that the Service squadrons should be increased from one hundred and eight to two hundred, eighty-six of which were to be stationed in France and Italy, forty in the other theatres of war, thirty-four in reserve, and forty to be long-range bombing squadrons whose duty it would be to attack the enemy in his own country. There is little doubt that the decision to build long-range bombers was taken in a moment which it is hard not to describe as one of panic. The Gothas, which flew over London on the 13th June, had dropped a psychological, if not a physical, bombshell on Downing Street. Within a few hours of the raid the Cabinet was meeting, and ministers were crying out for an immediate increase in British air-strength. The new machines were to be used not only to defend the capital, but to attack the attackers at home far away in Germany itself. Hence the proposal to create long-range bombing squadrons. It received little support from Haig, who remained of the opinion he had expressed when the proposal had first been made by Colonel Barés. The British Commander-in-Chief feared that in their haste to provide long-range bombers,

THE CABINET TAKES ACTION

the Air Board and the Ministry of Munitions would neglect the maintenance and upkeep of the seventy-six fighting, reconnaissance, and night-flying squadrons which he hoped would shortly be operating with his armies. Though assured that these would be given precedence he remained sceptical, and when asked for his views, made it clear that he still regarded long-range bombing as a luxury. Bombers, he maintained, should be used against the enemy's airfields. 'In this way alone, is it possible to compel the enemy to fight on his side of the line at a distance from the battle-front.' The War Office made further efforts to reassure him, but while they were hastening to explain that it was still their intention to put the requirements of the R.F.C. in France at the head of the list of priorities, the Gothas once more appeared over London and the position of the Government at once became acute. The attack of the 7th July roused great public indignation and the general misgivings concerning the country's air policy could no longer be ignored. No one realized this more clearly than Cowdray, who said as much at a meeting of the Air Board held four days after the raid. A consistent, vigorous, and intelligent air policy could not be pursued by calling an occasional conference between representatives of mutually antagonistic Services. This, indeed, was the crux of the matter. The dissensions between the Admiralty and the War Office, so prominent a feature of the Home Front in the previous year, had grown no smaller with the passage of time, and, as some members of the Board did not hesitate to say bluntly, would disappear only if it were to exercise its proper function and state what machines should be allotted to the Navy and what to the Army. If, however, it were to do so, then it felt sure that the heads of both those Services would meet immediately and oppose a resolutely united front to any such decision.

While on 11th July the Air Board was thus deploring its impotence in the Strand, the Cabinet was at last taking action in Downing Street. That day it set up a special Committee on which the Prime Minister was nominally to serve. The task before it was to find means whereby the Air Board would deal with policy as well as with supply and its moving spirit was Smuts. On the 17th August the great Boer performed the first of many signal services rendered to the country against which, a few years earlier, he had taken up arms. He produced a report which recommended the creation of an Air Ministry 'to control and administer all matters in connexion with air warfare of every kind and that the new Ministry should proceed to work out the arrangements for the amalgamation of the two air services and for the legal constitution and discipline of the new Service'. Among the considerations set out in support of this proposal was

AN AIR MINISTRY PROPOSED

one of special interest. 'The day,' said Smuts, 'may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populous centres on a vast scale may become the principal operations of war, to which the older forms of military and naval operations may become secondary and subordinate.' Such words had the true prophetic ring.

The wrath of the Admiralty and the War Office, which such a proposal was certain to provoke, was, the Cabinet considered, easier to face than the rising anger of the people of England at the continued refusal of Admirals and Generals to agree on the best use to be made of a new and mighty weapon. On the 24th August the Government appointed the Air Organization Committee of which David Henderson immediately became the moving spirit. It settled questions such as the composition of the Air Council and the constitution of the new Air Ministry, nor did it quail before the heavy task of deciding 'the multitudinous details connected with the amalgamation of the two Services and with Discipline, the Pay Warrant, and King's Regulations'.

Meanwhile, however, though the Cabinet had taken the plunge, it did not wish to advertise the fact, and the proposal to create a separate Air Force was kept a secret. In so doing, ministers had the support of Smuts, who thought that no public announcement should be made at that stage lest the enemy might thereby be encouraged to increase his own efforts. While the proposed change was known only to a few, the expected onslaught from the Admiralty and the War Office duly developed. It proved, however, a comparatively mild attack. The Admiralty fired no broadside at all, and the War Office confined itself to forwarding a copy of Smuts's report to General Headquarters in France. As might be expected, Haig's reaction was unfavourable; he was too concerned with securing adequate support in the air for his troops to do more than glimpse the wider issue. Still disturbed at the prospect of the long-range bombing of Germany, he was convinced that it would be upon this aspect of the war that the new Air Ministry would concentrate to the neglect of the requirements of his armies. Looming before him was the 'grave danger of an Air Ministry . . . assuming control with a belief in theories which are not in accordance with practical experiences'. His letter ended in a long and reasoned statement explaining the shortages from which the R.F.C. was still suffering. The repeated failure to make them good made him, he said, 'somewhat sceptical as to the large surplus of machines and personnel which the Air Organization Committee hoped to have shortly available'. Further than this, however, he did not go.

On the 21st September the War Cabinet took one more step which, considering the feeling at the time, can only be described

'TO CO-ORDINATE THE AIR SERVICES'

as revolutionary. It appointed the Aerial Operations Committee, of which the chairman was Smuts and one member Winston Churchill, to decide the whole question of priorities in the matter of all war equipment and munitions. The name of the Committee was shortly afterwards changed to the War Priorities Committee, and it continued in being for the rest of the war. To Smuts, its chairman, the British owe an incalculable debt. It was he who reviewed all claims for priorities in the light of his interpretation of the general war policy of the Government. In the fulfilment of this duty he showed a vision and a judgement which were immediately recognizable and, what was more important, recognized, and his decisions were accepted without murmur, for every Department of State knew them to be impartial.

It remained to inform the country of a decision which it was becoming increasingly difficult to conceal. Yet the Government still hesitated, and as late as the 8th October 1917 the Prime Minister could still quote with complacency Mr. Holt Thomas, once prominent as a pioneer of aviation, who gave it as his opinion that the time for the creation of an Air Ministry had not yet come. For a moment it seemed that the Cabinet's decision of principle, taken on the 24th August, would join many other such in the limbo of oblivion, and those who realized the importance of a unified air service were reduced to despair. On the 10th October Cowdray sadly informed an indignant Admiral that there was little prospect of an independent bombing force. The Admiral—his name was Mark Kerr and he had, after recent and prolonged study, reached the conclusion that Germany was concentrating on the building of heavy aircraft—seized his pen and in a memorandum which lacked nothing in vigour of expression warned his lordship of 'the extraordinary danger of delay in forming the Air Ministry and commencing on a proper air policy'. His grammar may have been a trifle shaky but his conclusions were sound and on the 15th October they were put before the Cabinet. After prolonged discussion it was decided to inform the House of Commons that a Bill to 'co-ordinate the Air Services and provide for the eventual setting up of an Air Ministry' was in course of preparation. On the following day, however, when Bonar Law made the announcement to a crowded and critical House, he left out the word 'eventual' and thus committed the Government to immediate action. In taking this course he showed undoubted wisdom, for his audience, representing as they did the people of England, and well aware of the depth of their feelings on the matter, would have brooked no further delay. Seven weeks later, on the 29th November, the Air Force Bill, presently to be known as the Air Force (Constitution) Act, received the Royal assent.

A STRONG TEAM SELECTED

After an unseemly tussle in front and behind the scenes, in which Lord Northcliffe, the Prime Minister, and *The Times* played parts ill-suited to their dignity, Cowdray was displaced and Lord Rothermere became President of the Air Board. On the 3rd January 1918 he was appointed Secretary of State for the Air Force, the first to hold this office. Of those over whom he presided and who formed the Air Council, the principal were the indefatigable David Henderson, now at long last to enter for a brief period upon his reward, Trenchard, fresh from the battle-fields of France, who was made Chief of the Air Staff, Mark Kerr, the energetic and outspoken Admiral, Paine, once the Commandant of the Central Flying School, who was in charge of all Staff matters, Brancker, the controller of all equipment, who was to lose his life years later in the R.101, and last, but by no means least, Weir, the Director-General of Aircraft Production at the Ministry of Munitions. It was on the whole a strong team, eager to plunge into the fray and to defeat the foe. There was, however, other work to do as well. First, a roof had to be found for the new Ministry and this proved no light undertaking. The aldermen of Westminster and the members of the Metropolitan Water Board were in turn outraged at the suggestion that their premises should have the honour of housing a Department of State. The Trustees of the Victoria and Albert and of the British Museums were equally indignant, though nobody seems to have thought that a museum was perhaps not the most suitable home for a young and energetic organization. Eventually the officials of the Ministry stayed where they were—in the Hotel Cecil—cheek by jowl with those of the Ministry of Munitions, on whose co-operation they could already rely.

The names by which the ranks in the new Service were to be known proved equally difficult to choose. The first proposals aroused the opposition alike of the War Office and of the Admiralty. The first was quick to note that under them all the senior officers were to be given naval titles and all the junior military; the second confined itself to the bland statement that the use of any naval title was objectionable. The Air Organization Committee spent many hours weighing the rival claims of 'Reeve', 'Banneret', and 'Ardian', the last being compounded of two Gaelic words, *Ard* meaning chief and *ian* or *eun* a bird. It was considered, however, that the literal translation of the word might impair the dignity of a senior officer, especially if he were elderly, and it was rejected. Military titles were chosen as a temporary measure, and it was not until the 27th August 1919 that an Air Council order gave their present names to the ranks of the R.A.F.¹

As with titles so with uniforms. The double-breasted khaki

¹ See Appendix II.

THE R.A.F. IS BORN

tunic of the Royal Flying Corps and the blue reefer jacket of the Royal Naval Air Service gave place to the slate-blue tunic of the Royal Air Force; and stars, crowns, and gold rings yielded to rings of plain braid. These decisions and many more relating to the transfer from the Navy and Army of the officers and men belonging to the new Service took some time, and it was not until the 1st April 1918 that it was officially constituted.

So at long last, seven months and eleven days before victory in the first war of the twentieth century against Germany was won, the Royal Air Force entered upon the opening phase of its perilous, doughty, glorious existence.

15. Fathers of the Fleet Air Arm

WHILE the armies of Great Britain and her Empire, supported by the Royal Flying Corps, were struggling to defeat their enemies in the muddy plains of Flanders and Picardy, in the hot deserts of Africa and Arabia, and in the stony land of Palestine, the Royal Navy continued to keep the seas. What the Royal Naval Air Service was able to do in 1914, 1915, and 1916 to share in this task has already been set down. As the war progressed and new machines with more powerful engines and armament were invented and produced, that share became of greater significance. Nor was it confined to home waters. The activities of the R.N.A.S. covered, it is true, the Channel and the North Sea, but they were equally apparent in the Mediterranean and the Indian Ocean.

It will be remembered that Samson had established an air base at Dunkirk as early as September 1914, and by February 1917, when unrestricted U-boat warfare began, it became of very great importance. After two years of monotonous patrol, interspersed with bouts of rigorous fighting, the force at Dunkirk found itself in the spring of 1917 able to increase the weight and volume of its operations. By then it was flying Sopwith 1½ Strutters in daylight bombing operations, and twin-engine Caudrons and single-engined Shorts at night. To these were soon to be added their much improved successors the Handley Page, a two-engined bomber, and the De Havilland 4.

Its efforts in February to do mischief to the German destroyers and submarines based on Zeebrugge were not, on the whole, very successful. Air photographs taken on the 1st February shewed that the inland harbour of Bruges was blocked by the ice of that severe winter, and that twenty-two torpedo craft and three submarines were lying there immobile. On the 10th they were attacked without appreciable results. True, the bombs fell on ammunition sheds nearby, but their contents obstinately refused to explode. The Germans retaliated by bombing Dunkirk, and a ding-dong struggle began. Our air assault was concentrated on Zeebrugge and its Mole, and in three attacks the Shorts dropped six 520-lb. bombs, at that time the largest in the world. On the 7th April they co-operated with the destroyer *Falcon* and four coastal motor-boats in a successful encounter with German destroyers lying in the Wielingen channel near Zeebrugge. The aeroplanes made a series of bombing attacks which occupied the attention of the defence and thus made it possible for the motor-boats to approach close enough to torpedo the German destroyer

G.88 and return to safety. When, a few days later, the Handley Pages, each capable of carrying fourteen 112-lb. bombs, arrived, they were for a short time sent out in daylight against German destroyers; but they soon proved too vulnerable and were therefore dispatched only at night, the day's skies being left to the D.H.4s of No. 2 Squadron stationed at St. Pol. These machines, with their 250-h.p. Rolls-Royce engines, could reach more than twenty thousand feet with a full load.

As the reluctant spring of 1917 began to make a belated appearance it became clear to Vice-Admiral Sir Reginald Bacon, commanding at Dover, that something much more drastic than bombing attacks was necessary to interfere with the enemy's naval forces at Zeebrugge and Ostend. His efforts, however, to use monitors for the purpose of bombardment, their fire being directed from the air, were not very successful. It proved impossible to hit the lock gates at Zeebrugge, and, at Ostend, though repair shops were damaged and a U-boat sunk, the port was not put out of action. Nevertheless, the Admiral went doggedly on, undeterred by anything the enemy sought to bring against his monitors. Not even *Fernleukboots*, electrically controlled, crewless motor-boats, their forepart filled with explosives and their sterns connected with the shore by many miles of electric cable by which they were steered, induced him to desist from his attacks. On the 22nd September he scored an appreciable success against Ostend, when thirty-five 15-inch shells from the Monitor *Terror* destroyed a launching slip, sank a floating dock containing a destroyer and a submarine, and damaged one of the lock gates. These results were made possible largely by careful spotting on the part of an observer in a D.H.4.

In addition to bombing and shelling these ports, the imaginative and indefatigable Admiral planned to put troops ashore with the object of recapturing the Belgian coast. This operation was to be carried out in conjunction with Haig's summer offensive in Flanders which, it will be remembered, had the same objective. The troops were to land at three points between Nieuport and Middelkerke; but before they could do so, it was of the greatest importance to discover the exact slope of the beaches. Self-propelled landing-craft with hinged ramps in their bows were then vessels of the future, and the troops were to make use of wedge-shaped pontoons thrust on to the beaches by monitors. If the slope was uneven, the pontoons might be stranded on ridges surrounded by hollows in which the water would be too deep for the assaulting infantry to negotiate. Since the whole coast of Belgium was in enemy hands, the only possible method of surveying the chosen landing-places was from the air, and to do so No. 2 Squadron took batches of photographs of them at twenty-minute

SURVEY OF THE GERMAN DEFENCES

intervals, from 11.25 in the morning till 5.36 in the afternoon of the 2nd July. To distract the enemy's attention a similar task was carried out by other aircraft over other beaches along the coast. The results were very carefully checked and Admiral Bacon was presently able to state that the slope of the beach had been deduced 'to within an accuracy of six inches from photographs taken fourteen thousand feet up in the air'. Once again the eye of the camera had proved an invaluable weapon of war, even though, in this instance, the projected landings never took place.

This survey of beaches possibly suited to the purpose of invasion was but one of the many photographic tasks carried out by the air squadrons based on Dunkirk. So great was their activity that, months before the war was ended, they had provided a complete and accurate picture of the whole German defence system, stretching from Nieuport to the Dutch frontier, and shewed that it was of the most intricate nature. The information thus obtained formed the basis of an exhaustive treatise on the whole subject prepared by the Naval Intelligence Division of the Admiralty, and destined to become the Bible of the Dover Patrol.

While most of the fighting strength in the air at Dunkirk was devoted to protecting our shipping and vessels of war in the Channel and the southern part of the North Sea, the bombing strength was almost entirely available to take part in the ill-fated Flanders campaign. When it opened, No. 7 and No. 7a Squadrons flying Handley Pages, and No. 5 De Havilland 4s, made many attacks on railway junctions at Ghent, Ostend, Thourout, and elsewhere. By day, aerodromes and troops were attacked by the Sopwith Camels of No. 3 Squadron. The most successful raid was that of the night 16th-17th August, when fourteen Handley Pages dropped more than nine tons on the railway system at Thourout.

While the R.N.A.S. was in daily action over Flanders, the enemy began his Gotha attacks on London and elsewhere. It fell to the Dunkirk Handley Pages and D.H.4s to bomb the aerodromes from which these machines set out. Raids made in them at the end of September caused two flights of the German squadron to move farther inland and from their new aerodromes they retaliated fiercely. At dusk on the 24th September great damage was done to the R.N.A.S. depot at St. Pol. A lucky or a well-aimed high explosive bomb hit the pump-house, cutting off the water-supply; fires, caused by the incendiaries, consumed the engine repair shop, the machine shop, and other vital places, including the engine packing shed where a hundred and forty aircraft engines were destroyed. A week later, twenty-two Gothas dropped ten more

BOMBING POLICIES

tons of bombs on the depot, and the fires then started consumed twenty-three aircraft, for once again the water mains were hit and the hoses could not be used. After this second onslaught the depot was completely out of action and all repair work came to a standstill.

The target chosen for the Handley Pages was of even greater importance, but far more difficult to hit. In four nights twelve and a half tons of bombs were aimed at the lock gates at Zeebrugge, but the damage done was slight. The Germans, however, were taking no chances. Their submarines were too valuable to be exposed to possible destruction from the air. In August 1917 they began to build concrete shelters at Bruges, which were the forerunners of those constructed in the next war from Trondhjem to Bordeaux. Not many of them had been completed when the fighting ended.

In general, the bombing operations carried out by the R.N.A.S. from Dunkirk were a failure. In 1917 they dropped a total of 344 tons of bombs, with which they hit no target of importance. Those in command—and there were too many of them—were each concerned with the peculiar importance of his own particular objective. The Germans did not suffer from the effects of divided councils, and by the persistence of their attacks on the St. Pol aircraft depot showed what a policy of concentration could achieve. It was not followed on our side of the lines. We were content to divide our forces and to attack no place for very long, for those in command were deeply imbued with that British spirit of compromise which has so often proved of inestimable advantage to our enemies in time of war. 'Too little and too late', a bitter phrase used in the next war to describe such heavy defeats as those sustained by British arms in 1940 in Norway, and 1941 in Greece, Crete, and Malaya, might, had it been thought of, have been applied with equal justice to blunders of the same kind committed in 1915, 1916, and 1917. The gallant but ineffectual efforts of the Dunkirk bombing squadrons must be counted among their number.

It is time to move south to the treacherous, gleaming Mediterranean, and the tropic seas beyond the Gulf of Aden. The fighting was of two kinds: by land in Macedonia and by sea as far as the Maldives Islands in the Indian Ocean. The first was the responsibility mostly of the R.F.C., the second of the R.N.A.S. After the withdrawal from Gallipoli, the Allies were compelled to wait a long while before resuming active operations. One of them, Serbia, through the behaviour of Bulgaria, which at a critical moment entered the war on the side of Germany, had been

overrun and its army forced to withdraw to the Adriatic across the inhospitable Albanian mountains. While the Serbs were thus retreating, British and French troops were put ashore on Greek territory. As was almost inevitable, they arrived too late to be of use to Serbia, and by December 1915 they were entrenched round Salonika. Such air support as they had was provided by seaplanes from the aircraft carrier *Ark Royal* and by the French Air Force, whose machines carried British observers. In July 1916 No. 17 Squadron, equipped with B.E.2cs and B.E.12s, reached the Macedonian front and was soon engaged in never-ending reconnaissance work, being presently joined by No. 47 Squadron. Their patrols carried them over the desolate hills about Lake Doiran and the malaria-haunted lands traversed by the Vardar and the Struma. The enemy was also active in the air, and one of his pilots, Leutnant von Eschwege, soon gave a great deal of trouble. Known to the Bulgarians as the Eagle of the Aegean, and with considerable experience of the Western Front behind him, he arrived at Drama, the German headquarters, at the beginning of 1917 and soon had several British victims to his credit. One of them, Lieutenant J. C. F. Owen, was brought to trial by the Bulgarians on a charge of having destroyed his aeroplane after he had been forced down. He was stubbornly defended by von Eschwege, who was responsible for his plight. This German airman shot down many R.F.C. and R.N.A.S. pilots with whom he fought frequent duels, especially with Captain G. W. Murlis-Green, a doughty opponent, until on the 21st November 1917 he succumbed at last not to a pilot of the R.F.C., but to a *ruse de guerre*. The basket of a captive balloon belonging to No. 17 Balloon Section, which had been operating on that front since the autumn of 1916, was filled with 500 lb. of explosives and an observer made of straw. Von Eschwege dived upon it, the charge was fired, his aircraft wrecked, and he himself killed. He had been noted throughout his career as a clean, eager fighter, always ready to accept battle, but it must not be forgotten that the Fokker, and later the Albatros, which he flew, were better than any machine which could be brought against them.

Bombing and counter-bombing, varied by reconnaissance, was the routine of both air forces throughout 1917. Most of the time the Germans had the advantage, for their aircraft were better and more modern. Moreover, on the 17th May a disastrous explosion, accompanied by fire, destroyed many of the Sopwiths assembled to form the nucleus of our bomber force. A month earlier the British and French arms had suffered a set-back at the battle of Doiran, where the attack had failed mostly for lack of efficient artillery preparation, itself due to inadequate air support. Until the arrival of Allenby in the Mediterranean theatre the R.F.C.

ALL-PURPOSE AIRCRAFT

suffered from the refusal or inability of the authorities at home to supply it with aircraft superior, or at least equal, to those of the enemy. Even as late as September 1917 Lieut.-General G. F. Milne, commanding the British forces under General Sarrail, was still writing home officially to say that the Bulgarians had 'as yet hardly realized the stress of war' for lack of a single strong bombing squadron with which to attack them. A few comparatively modern fighters, S.E.5As and Bristol Monoplanes, reached the harassed General between December 1917 and February 1918, but it was not until the formation of the Royal Air Force that something like air superiority was at length achieved.

Yet despite their inferiority and the arduous nature of their tasks, life in Nos. 17 and 47 Squadrons had its compensations. On other fronts specialization soon came to be the rule. Squadrons were composed either of fighters or bombers or reconnaissance aircraft. It was not so in Macedonia. The hard-worked obsolescent aircraft were used for all three purposes, sometimes on the same day. In the morning a pilot might be observing for the guns, and in the afternoon find himself at his allotted station in a bomber formation heading for Prilep or Drama.

In their efforts to give adequate air support to the armies struggling in the unhealthy valleys of the Struma and the Vardar, the R.F.C. were helped by the R.N.A.S., which operated from land bases in the islands of Thasos and Imbros, in whose harbour of Mudros the *Ark Royal* had cast anchor in March 1916. They made many bombing attacks in support of the armies on the Salonika front. The targets were varied, and on the 30th September 1916 included a train about to enter the station at Angista. The bombs of the seaplane missed, but the pilot, attacking with his machine-gun, saw the engine-driver and fireman leap from the footplate and allow the train to continue towards its destination without their services. Two months later the German seaplane base at Gereviz on Lake Boru was almost wiped out.

The squadron based on Imbros constantly reconnoitred the Gallipoli peninsula, and on being reinforced in October 1917 by two D.H.4s made a number of bombing attacks on the bridges of the main Sofia-Constantinople railway. Bridges are notoriously difficult to hit, and it was not until January 1918 that the D.H.4s succeeded in putting two bombs on that which crosses the Strumitza at Lule-Burgas. They operated from Lemnos, where an airship station for anti-submarine patrols had long been established. From July 1917 onwards bombing raids were also undertaken by a single Handley Page which had flown two thousand miles from England in order to do so. On the 9th July it attacked the battle-cruiser *Goeben* at anchor in the harbour of Constantinople, but its 112-lb. bombs, though several hit her, did little

ALCOCK'S BUSY DAY

damage. The Turkish War Office and other targets were also bombed, and the Handley Page returned in safety. It carried out two other long-distance raids, one on the 6th August on warehouses and shipping at Panderma, on the Sea of Marmara, and another on the 2nd September on Adrianople.

The enemy did not leave these island air bases alone, and his numerous attacks were met by Sopwith Camels which reached the squadrons in 1917. A fight on the 30th September of that year is memorable for the feat performed by Flight Lieutenant J. W. Alcock, afterwards to be the first man to fly the Atlantic. He forced down into the sea a German single-seater fighter, himself flying a machine officially described as a Sopwith Camel, though in point of fact it had been built to his own design round a Benz engine taken from a German twin-engined bomber brought down six months earlier in Macedonia. Just as the German attack on Imbros was delivered; this hybrid was about to be tested and the engine was being warmed up while Alcock was taking his morning bath. Leaping from it when the alarm sounded, 'he put on his pyjamas, ran to the machine, got into the air, bagged Muller [the name of one of the German pilots shot down] before they were out of sight. . . . The machine he designed was twenty miles an hour faster at ten thousand feet than anything we had.' That same day Alcock took the Handley Page on its last flight. An engine cut out on the way to Constantinople and he was forced to come down in the Gulf of Xeros. After an hour's swim he and his crew reached land and were made prisoners by the Turks.

While the R.N.A.S. aeroplanes were engaged in operations on the Salonika front, the seaplane-carriers, *Ben-my-Chree*, *Empress*, *Raven II*, and *Anne*, were active in the Eastern Mediterranean, where their duties were many and various. What they did to support Murray in the Sinai campaign has already been described. Before joining them the *Empress* had gone to Milo Bay to supply air support for the punitive squadron there assembled for an attack on Athens, where King Constantine was showing a preference for the Kaiser, his relative, rather than for Venezelos. The threat of action, however, sufficed for the moment, and she presently sailed eastwards.

The main problem which soon faced the Navy was, as ever, the development of submarine warfare. Among the lovely islands of the Aegean, U-boats could find many out-of-the-way coves from which they could sally forth to prey upon our ships with their freight of men and material for the Palestine and Mesopotamia campaigns. Cattaro and Pola in the Adriatic were the ports of repair and supply for the submarines, and it was against them that the main effort was directed. The Italian Fleet, based at

U-BOATS IN THE MEDITERRANEAN

Taranto, was of small assistance and the barrage of steel nets erected across the Straits of Otranto, in imitation of that covering the northern end of the Straits of Dover, was not very effective, for the U-boats took advantage of the deep water to dive beneath it. As early as May 1916 Rear-Admiral Mark Kerr, in command of the British Adriatic squadron, began to call for air support, and continued to do so without result throughout that summer. After much Allied bickering the Admiral succeeded in February 1917 in establishing a seaplane base at Otranto. It had an impressive establishment—on paper. Two seaplanes were to patrol the net barrage and twelve Short torpedo-carrying seaplanes were to carry the war into the enemy's harbours. Not until September of that year were they ready for action, and then all attempts to attack submarines in Cattaro failed because of bad weather. It was only after the formation of the R.A.F. in 1918 that any success was achieved. Throughout 1917 the depredations of U-boats in the Mediterranean were considerable, and the reason for this was the lack of effective air patrols. As late as the 9th October the British Commander-in-Chief could only describe them officially as 'spasmodic', but he went on to add that it was remarkable 'how many submarines were hunted and attacked in view of the small number of machines available for flying'. Between May and the middle of September 1917 thirteen attacks had been made by aircraft.

In the Eastern Mediterranean the aircraft-carriers operated sometimes off the Syrian coast and sometimes on the other side of the canal in the Gulf of Aqaba and the Red Sea. On the 9th January 1917 the *Ben-my-Chree* was hit by shells from a masked Turkish battery off the coast of Asia Minor, near the island of Kasteloriso, and sank. She had proved a great nuisance to the Turks for eighteen months, and her Sopwith seaplanes had done much useful work. The *Empress* took her place, while the *Raven II* and the *Anne* were attached to the East Indies squadron operating in the Red Sea and the Indian Ocean. They were engaged in assisting the Arab revolt when a German sea raider, the *Wolf*, was reported at large in the Indian Ocean. Commander Samson took the *Raven II* to a rendezvous with a French cruiser at Aden. Together they were to seek out the raider. The seaplanes of the British carrier, in peace-time an elderly German tramp, were to find her, the guns of the French cruiser to destroy her. In March they explored the Laccadive Islands, but found nothing. Flying over them was an exhilarating experience. 'You could see for miles when in the air,' wrote Samson, 'while below you saw the bottom of the sea and hundreds of islands of all shapes and sizes, some above water, others being made beneath the sea, some day to rise above the waves.' In April the ships were off the Maldives

ADVENTURES OF A SEAPLANE

Islands, and on the 21st Flight Sub-Lieutenant G. D. Smith and Lieutenant W. C. A. Meade took off in a Short seaplane to search them. By nightfall they had not returned, and though the *Raven II* looked for them for three days, only a patch of oil and a ship's biscuit were found. Taking these as evidence of their loss, they were reported missing, believed drowned, and it was not until the 6th May that they were able to report again for duty. What had happened in the intervening fortnight was this. After flying for some time they ran into a storm and were eventually forced to land in darkness on a coral reef off the most southerly of the Maldive group. About midnight the rising tide floated off the seaplane and, helped by tropical lightning and flares fired by his observer, the pilot taxied her from one island to another, seeking a channel to the open sea. Towards dawn they ran on to a beach and made the seaplane fast to a palm-tree. Day broke cheerless under heavy rain. Smith and Meade built a shelter with palm leaves, and for food shot down coco-nuts with their Lewis gun. In the afternoon they stripped and aided the tide to refloat the seaplane, which was but little damaged. Eventually they flew her off, but by some mischance left their clothes behind and found themselves naked in the air. They had petrol for only one hour's flying, and during that space of time failed to find the *Raven II*. At the last moment what they did discover was a lagoon, on which they alighted and swam ashore. One of them was then wearing a Gieves waistcoat, the other an air-bag taken from the seaplane. Once ashore, exhausted, they fell asleep beneath a coverlet of hastily gathered palm leaves, but at midnight 'were awakened by three natives who, when greeted with the word "Salaam", fled'. On the next day they tried to construct a raft, and, in so doing, attracted the attention of some native fishermen. These were eventually induced, with marked reluctance, to take the officers on board their fishing-boat and the seaplane in tow. In this wise they reached the island of Fiale, where they remained four days, their waking hours being passed in singing and dancing with their rescuers and their sleeping in the huts set aside for bachelors. They were then taken in a native dhow to the Sultan at his residence on Male Island. He was delighted to meet them, clothed them in the uniform of his bodyguard, and entertained them with regal magnificence, before sending them to Colombo. Here they rejoined their ship, which then returned to Male Island, salvaged the seaplane, and took on board two goats, a young bull, and two turtles, presents from the hospitable Sultan. Several more flights were made, but the *Wolf* was undiscovered, and by the 10th June the *Raven II* was back at Port Said.

The adventures of Smith and Meade had had their counterpart three years earlier in an operation at that time unique in the

history of war. It is fitting to close this chapter with some description of it, for it provides a striking example of the power possessed by the observer in the air to find an enemy, however well and cunningly concealed.

On the 20th September 1914 the German light cruiser *Konigsberg* fought and sank the British light cruiser *Pegasus* off Zanzibar. The enemy warship had been ordered to carry out a raiding cruise in the Indian Ocean, but after this successful action she abandoned this intention, and, turning west instead of east, sought shelter in the Rufiji Delta on the east coast of Africa. Her place of refuge was a maze of channels intersecting two hundred square miles of swamp covered with almost impenetrable vegetation of which mangrove-trees were the most prominent feature. There were five possible exits, and it would have required a small fleet to blockade them all. Though the Admiralty knew her whereabouts they were not aware of her precise position. It was discovered from the air.

On the 22nd of that month Mr. H. D. Cutler, by profession an exhibition pilot, who on the outbreak of war had found himself and his two Curtiss flying-boats hastily commissioned in the R.N.A.S., took off from the tiny island of Niororo, eighteen miles from the Rufiji Delta. The flying-boat's hull was leaky and the tropical climate so reduced the power of her engines that Cutler had to fly without his observer, Midshipman A. N. Gallehawk. Even so, he was only just able to rise into the air. He flew up and down the inhospitable coast, but, not having been provided with a compass, lost his bearings, failed to locate the Delta, and eventually came down for lack of petrol on the beach of an uninhabited island. From this, by the merest chance, he was rescued by his parent ship, the *Kinfauns Castle*. Two days later, having patched the hull, he took off again, and this time had the good fortune to discover the *Konigsberg* some twelve miles up the largest of the five tideways. She had been well hidden among the thick-growing mangrove-trees, but Cutler flew right over her and saw that she had steam up and was evidently prepared for sea. His report was at first disbelieved, for the Admiralty charts showed that the channel in which she had been found had insufficient water for a ship of her class. A second reconnaissance was therefore ordered, but since Cutler was only a civilian in disguise and therefore deemed to know nothing except how to fly, he was to be accompanied this time by a naval observer. The hull of his machine, however, was still leaking and ten days elapsed before that belonging to the second Curtiss flying-boat, left behind at Durban for lack of a pilot, arrived and was fitted with some difficulty and the aid of the ship's blacksmith. Taking the captain of the *Kinfauns Castle* aboard, Cutler made his third reconnaissance, when the

A PATCHED AND LEAKY FLYING-BOAT

truth of the report he had made at the end of his second was entirely confirmed.

The nearest British warship capable of dealing with the German cruiser was the *Chatham*, and she was at Mombasa. Until she arrived off the Delta, there was every chance that the *Konigsberg*, now that she had been discovered, might put to sea. Only air reconnaissance would shew whether she had done so; but turbulent seas made it impossible for Cutler to take off again until the 10th December. By that time the new hull of his flying-boat was in as bad a condition as the old and once more he had to fly alone. A mile up the tideway his engine failed, and he was forced down. While striving to re-start it, it was put out of action by a rifle bullet fired from the shore, and a few minutes later three Germans and fifteen Askari waded out and made him prisoner. While he was being hurried through the bush towards the *Konigsberg*, he heard the sound of shots. Midshipman Gallehawk had arrived in a motor-boat, but could do no more than rescue the damaged flying-boat, which was towed away under heavy rifle fire. It was wrecked beyond repair, and was placed in a museum at Durban as a constant reminder of what one man, flying a patched machine neither sea- nor air-worthy, was able to do in the accomplishment of his duty. It was not until November 1917 that Cutler regained his liberty.

Though the threat of observation was now removed, for the flying-boat was no more, the *Konigsberg* did not put to sea, but remained in her noisome hide-out. The Admiralty was making every effort to compass her destruction, but seaplanes and a ship with guns able to throw a shell at least twelve miles were obviously indispensable. Eventually, on the 21st February 1915, two Sopwith seaplanes reached Niororo. They were not powerful enough to carry bombs, and after one reconnaissance made by only one of them, for the other had almost immediately become unserviceable, all hope of bombing departed. The pilots and mechanics laboured unremittingly to make the remaining Sopwith capable of flight. Its engine, a 100-h.p. Monosoupape, was quite unsuited for the tropics, its propeller warped, the glue in its wings and floats melted so that their bottoms peeled off, and its rubber tubing perished in a few days. Since it would carry only the pilot, it was the practice of the observer, after starting the engine, to dive off a float and swim to the whaler of the *Kinjauns Castle* standing by. He desisted only after being pursued by a shark.

By the end of April Short seaplanes, elderly but capable of flying, arrived, and on the 25th one of them took photographs of the *Konigsberg*. Since, because of the weight it had to carry, it could reach a height of not more than six hundred feet, it is hardly surprising to learn that it was shot down before completing

NAVAL BATTLE IN A JUNGLE

the task. Several more reconnaissances were made, but it was clear that to bomb the *Konigsberg* was still impossible. Efforts were therefore made to attack her by a motor-boat carrying a torpedo. All was ready for the attempt when news came that warships, aeroplanes, and seaplanes were on the way. On their arrival in June at Mafia Island nearby, they were found to consist of two 6-inch monitors, the *Mersey* and the *Severn*, two Henri Farmans with air-frames made of steel tubing, and two Caudrons. An aerodrome was laboriously constructed out of the jungle, and rehearsals for spotting the fall of shot from the monitors were begun. In the course of them one Farman and one Caudron were soon wrecked.

Vice-Admiral H. G. King-Hall, in command, decided that no further time could be lost, for the monsoon season was at hand. On the 6th July the *Severn* and *Mersey* nosed their way up the channel under rifle fire from both banks, while the Caudron bombed the *Konigsberg* ineffectively from six thousand feet. The strength of the current caused delay, but at 6.48 a.m. both monitors, with the Henri Farman to spot for them, opened fire at a range of eleven thousand yards. The *Konigsberg*, however, was no content to remain a passive target. She fought back with determination and skill, making good use of an observation post hidden in a tree and not discovered for an hour. During that time the *Mersey* was hit and her forward 6-inch gun put out of action before it had done any damage to the enemy. She shifted her berth and had hardly done so when a salvo fell accurately on her former position. Her sister-ship was more fortunate. By 8 a.m. the *Severn* had scored half a dozen hits on the *Konigsberg*, but she, too, was soon forced to shift. While on the move one of her look-outs descried, only four hundred yards away, a platform with figures upon it. They were wiped out by 6-inch shells fired at point-blank range, and after that the shooting of the *Konigsberg* became far less accurate. By now, however, the wireless set in the Farman had broken down, and the Caudron's engine showed symptoms of failing, soon to prove fatal. Nevertheless the bombardment was resumed in the afternoon and continued until the evening, when it was clear that the operation would have to be repeated.

Five days passed before it was possible to do so, and during that time the aeroplanes were repaired. Then the gunboats re-entered the tropical river and the *Severn* opened fire with the Farman to help her, while the *Mersey* cruised up and down, seeking to engage the attention of the enemy. The Germans, however, were not deceived, for one of their officers, hidden in a tub sunk in the mud only thirty yards from the *Severn*, was directing the fire of his ship. Fortunately for the monitors the

telephone line connecting him with her was soon severed by a shell.

The bombardment went on for three-quarters of an hour, and the *Konigsberg* was hit by the ninth and by subsequent salvoes. She continued to fire back and also to engage the Farman. A well-aimed shot removed two cylinders from its engine and the pilot, Flight-Commander J. T. Cull, began to glide towards the *Mersey*, though she was farther away than the *Severn*. That ship, however, was in action and the pilot did not wish to distract her. 'On the way down,' he said in his report, 'Flight Sub-Lieutenant Arnold [the observer] continued very coolly sending corrections, and gave one very important one, bringing the *Severn's* shots from forward to amidships, and we had the satisfaction of seeing shells falling on the middle of the *Konigsberg* before we lost sight of her.' As the Farman hit the water an explosion tore the decks of the German cruiser seven miles away. The last message of the falling aeroplane had been singularly effective; her work was done, for columns of black and yellow smoke now betrayed the exact position of the enemy, and further explosions soon shewed that the monitors' fire was becoming deadly. The Caudron flying over her reported her middle funnel blown away and her stern enveloped in flames. After twenty-five further salvoes she was on fire from stem to stern. A final reconnaissance made at the beginning of August showed her to be little more than a wreck, but the observer saw that some of her guns were being removed into a lighter. They subsequently did good service with the German armed forces in East Africa.

The Naval Air Service then took part in the campaign against Colonel von Lettow-Vorbeck and soon found themselves within sight of the snow-capped mass of Kilimanjaro and the red cliffs of the Pare mountains. Here the densely wooded country afforded perfect cover for troops, who could not be seen from the air unless through lack of care they betrayed their positions. On the 8th January 1916 the R.N.A.S. made a bombing attack on the native levies of the enemy, who scattered in panic, crying out that Muungu, a supernatural being of terrible power, had attacked them with evil spirits (bombs) and struck their land with barrenness. Joined in March by an R.F.C. detachment, the R.N.A.S. assisted Major-General J. L. van Deventer's force, and were afterwards most useful in mapping the vast and largely unexplored regions in which the fighting took place. The campaign did not finally end until the Armistice of 1918.

The diversity of events described in this chapter is a reflection of the diversity of duties performed by the R.N.A.S. in the three years of its existence. It was always a part of the Royal Navy, and as such had a share in the good fortunes and hardships, the

'ALL THE WIDE OCEANS'

set-backs and successes, of a Service which has for its field of action all the wide oceans of the world. The Fleet Air Arm, in some respects its child and successor, can remember with pride the exploits of its father. The pilots of the R.N.A.S. were the first men who, having gone down to the sea in ships, went up in the air from them, and fought a grim, not always successful but ever gallant, fight against the enemy and the elements.

16. Air Power Climbs to the Zenith

NINETEEN-EIGHTEEN has been called the year of victory, yet much of it, at least as far as the Western Front was concerned, was consumed in desperate efforts, only in the end successful, to stave off defeat. By then the forces of the Allies were engaged in battle from the Channel to the Tigris, from the Italian Alps to the Persian foothills. How their air forces fared in the different theatres of war, up to the moment of the last and most desperate struggle which was to end in victory, has been told. Now must be set down how 'out of this nettle danger we pluck this flower safely', a quotation which when, twenty years later, it fell from the lips of a British Prime Minister as he stepped from a civil transport machine, was soon to be of ironic significance. We will follow the sun of victory from its rising in the east above the heads of Allenby's hardy soldiers, on over Macedonia and Italy till it reaches its zenith above a railway carriage in the forest of Compiègne.

We left Allenby resting a brief moment in the captured city of Jerusalem, but not for long. He had entered the Holy City on the 9th December 1917 and by the end of the month his armies had advanced northward sufficiently far to drive the Turks beyond striking distance. During those winter days of rain and flood the R.F.C. was constantly engaged on reconnaissance and photography, No. 67, the Australian squadron (soon to be known as No. 1 Squadron, Australian Flying Corps) photographing no less than 624 square miles of territory in a fortnight. They then assisted the army to sweep the Turks out of Jericho and over the Jordan, thus securing Allenby's right flank. Early in March the enemy, now under the command of General Liman von Sanders, who soon shewed a marked preference for rigid, as opposed to flexible, forms of defence, were moving in a north-westerly direction. During the fighting which ensued, some of it hard and costly, air support was given by Nos. 14, 142, 113, and 111 Squadrons and No. 1 Squadron Australian Flying Corps. A pilot of No. 111 found himself one day, after a combat with the enemy, returning to base behind a badly damaged engine. Though it did not altogether stop, it would not always turn fast enough to maintain him in the air, and he went home in a series of gigantic hops during one of which he carried away on his undercarriage a clothes line from which the undergarments of a number of the enemy were pendent.

By the middle of the month Allenby felt himself sufficiently secure to undertake operations on the east bank of the Jordan

ALLENBY'S LAST CAMPAIGN

and thus give aid to Colonel Lawrence and the Arabs under Feisal. Lacking the necessary troops, he could not establish himself permanently on the east bank of that river, and he therefore confined himself to a number of raids, in which his air forces did not always play an entirely successful part. About the middle of March pressure from the Arabs, though spasmodic, had on the whole forced the Turks back, and it was decided that a raid on Amman, some thirty miles north-east of the Dead Sea, would be of help to Feisal and might enable him to capture Ma'an. At first, despite bad weather, all went reasonably well, and the First Australian Light Horse entered Es Salt, slightly to the north-west of Amman, which had been attacked more than once from the air. It proved, however, too strong to be captured by the army; a bombing raid by thirteen German aeroplanes disorganized the Camel Transport Corps and further operations soon became impossible. The force withdrew at the beginning of April to the west of the Jordan, having done no more than arouse in the breasts of the Turks a confidence in Liman von Sanders which subsequent events did not justify.

Nor did a further raid in the same area carried out in May 1918 prove any more successful. The main reason for its failure was the skilled use of cover made by the Turkish reinforcements which Liman von Sanders had brought up. They hid in wadis and nullahs so effectively that the German Commander-in-Chief himself found great difficulty in locating some of them, even though he knew their whereabouts. Had these reinforcements been discovered from the air Allenby's dispositions would undoubtedly have been different.

The fierce heat of the summer months restricted operations. Allenby was biding his time, turning over in his active mind a plan for the utter destruction of the Turks. The campaign which opened on the 19th September 1918 is one of the few masterpieces of modern war, and it owed no small part of its success to the operations of what was by that time the Royal Air Force. Allenby intended to attack northwards along the sea-coast of Palestine, with the bulk of his infantry and cavalry, and thus cut railways and roads far behind the Turkish armies, whose retreat would then become impossible. Mobility was the key to success and he intended to fight a campaign of movement. In order to deceive the enemy it was decided to make frequent demonstrations on the right of the British line in the Jordan valley and beyond.

The position of the Royal Air Force at the opening of the battle was enviable, for its pilots were at last masters of the air. The winning of this essential domination was one more consequence of sea power. The R.A.F. were by then receiving constant, if not large, reinforcements from England via Egypt, and were at all

times assured of ample supplies coming by sea under the protection of the Royal Navy. The Germans, on the other hand, were dependent on long, uncertain lines of communication stretching over land, and at the mercy of an increasingly incompetent ally. Their pilots were full of courage, but it is not always possible even for brave men to fight with conviction when they know that their weapons, if lost or damaged, are irreplaceable and that reinforcements can never reach them. The German airmen were fiercely attacked whenever they ventured to take the air, and rarely succeeded in fulfilling their missions. 'Between the spring and the autumn,' says Liman von Sanders, 'the excellent air service lost fifty-nine pilots and observers. In September, air reconnaissances of the British positions had almost ceased.' The physical and moral effect on the Turks of having to fight without air support will very shortly be seen.

As in the preparations for the campaign which ended in the capture of Jerusalem, Allenby used every art to conceal from the enemy the place and time of the new blow which he was about to strike. To prevent the enemy from discovering his large cavalry force on the coastal plain was of vital importance. Salmond and other air officers were called into consultation, and an elaborate scheme of concealment and deception was evolved. Far to the east dummy horse-lines were constructed on a wide scale, and troopers moved about them dragging brushwood behind their mounts in order to create clouds of dust and thus further to heighten the illusion that the main cavalry force was much further inland than it was. Over its actual position constant fighter patrols were maintained and the utmost precautions taken on the ground to hide all movement. Cooking was done not over wood fires, whose smoke would betray the troops, but over cubes of solidified alcohol, and a most rigid black-out through the hours of darkness was imposed and maintained. Nevertheless Liman von Sanders did receive word of what was impending, for an Indian deserter gave information of the attack two days before it began. The German general, however, refused to believe him and appears to have thought that a variation of the trick which had deceived the Turkish Commander-in-Chief a year previously was now being played on him. The commander of the Turkish Eighth Army was less sceptical and pleaded to be allowed to withdraw to a stronger line; Liman von Sanders sternly refused, and, when Allenby moved, the Turkish armies were exactly where he expected and desired to find them. Had even one German reconnaissance machine been able to fly across our lines the position might have been very different, but the Royal Air Force had seen to it that such a feat was impossible.

Before the advance began, bombing attacks were made on

certain important enemy centres, notably at El Affule the central telephone exchange of the Turkish group of armies, on Tul Karm the headquarters of the Turkish Eighth, and on Nablus the headquarters of the Turkish Seventh Army. In some of these raids the only Handley Page in the Middle East was used with great effect. The air attacks were an encouraging prelude to the overwhelming success which was soon to follow. When day dawned on the 19th September and the British infantry moved forward, Liman von Sanders in his headquarters at Nazareth was in complete ignorance of the situation and remained in that condition for several vital hours. The wires were down between Tul Karm and Nazareth, and the wireless station at the first of those places was obstinately silent. Nor could the German Air Force render the General any assistance. Many days had passed since they had been able to complete a reconnaissance flight, and on that morning the air over their main aerodrome at Jenin was continuously patrolled by pairs of S.E.5as, which dropped in all 104 bombs and made it impossible for any machine to take off.

In addition to their task of bombing and keeping the German Air Force on the ground, the R.A.F. were also to co-operate closely with the leading cavalry divisions. This they did with great ability, and Allenby was never left without information of the progress of the attack. To help the infantry, notably those of Lieut.-General Sir E. S. Bulfin's XXI Corps carrying out the main attack on the left, No. 113 Squadron was to make a smoke-screen at two chosen points. When the attack began they did so successfully at the first of these but, before they could reach the second, it had already been overrun, and they eventually put smoke down over a Turkish position much farther back. This was the first occasion in warfare when aircraft were used for such a purpose. The R.E.8s of No. 113 Squadron performed the same service then as was to be carried out twenty-four years later by their faster-flying descendants over the grim headlands and beaches of Dieppe.

By nightfall on the 19th September two Turkish divisions in the Plain of Sharon had virtually ceased to exist; seven thousand prisoners and a hundred guns were in our hands, and the cavalry were through and pressing forward towards El Affule and Nazareth. That day the R.A.F. shewed what could be accomplished by attacking troops and transport in narrow defiles. Bristol fighters, D.H.9s and S.E.5as caught large numbers of Turkish troops, much encumbered with transport, moving eastwards from Tul Karm towards Nablus. When they were deep in a defile from which escape was impossible, they were fiercely and repeatedly bombed and machine-gunned. 'The British air squadrons,' said Liman von Sanders, 'relieved every half-hour,

SPEEDING THE TURKISH RETREAT

flew very low and continuously bombed, and they covered the roads with dead men and horses and shattered transport.' This was but a foretaste of what was to come two days later.

Before the battle began, an exhaustive study, based on the evidence of air photographs, had been made of the possible lines of Turkish retreat. Every place where the straightness of the way would make deployment impossible had been carefully noted. Such foresight and planning was to reap a rich and ghastly reward. By 8 a.m. on the 20th September Allenby knew from his air reports that the great encircling movement, begun the day before, was in full and accurate swing. The Turkish army nearest the sea was in full retreat and was already in a state of confusion which in twenty-four hours was to be complete. Its destruction as a fighting force made the position of the other two armies on its left flank impossible. The adventures of 2nd Lieut. E. R. Stafford in an S.E.5A of No. 145 Squadron provide a vivid picture of what was happening throughout that confused, triumphant day. Flying at noon above Jenin, he dived on a body of Turks and scattered them with machine-gun fire. His next target was transport moving northwards along the road to El Affule. As he was diving on a number of lorries his engine cut and he had to make a forced landing. Some Turkish officers took him prisoner and made off with him towards El Affule. Stafford knew that our cavalry were pressing towards it but kept this knowledge to himself. Before they reached the town what he hoped had happened. A patrol of Indian cavalry made towards them and the parts of captor and captive were reversed. A free man once more Stafford pressed on and reached the aerodrome at El Affule, where he found R.A.F. aircraft already on the ground and a machine about to take off with the mail. This had been delivered a few moments before by a German two-seater, of which the pilot was under the impression that El Affule was still in Turkish hands.

By the evening of the 20th the Turkish Eighth Army in the coastal plain had almost ceased to exist. Its remnants were in full flight. Next to it the Turkish Seventh Army was shewing signs of uneasiness, soon to develop into panic when it realized that cavalry and armoured cars had cut all its lines of retreat, save those which led eastward to the doubtful hospitality of the land of Moab. Only the Fourth Army beyond the Jordan seemed unaware that great events, involving the utter defeat of Turkey, had begun to take shape.

Of the five ways of escape open to the Seventh and the remnants of the Eighth Army, the most important was that which ran south of Nablus and crossed the Jordan at Jisr ed Damiye. For part of its length the road ran through a deep defile, the Wadi el Far'a. On one hand rose the sheer sides of inhospitable hills, on the other

TRAPPED IN THE WADI EL FAR'A

was a deep watercourse reached by a number of steep and perilous ravines. This place of desolation was soon to be peopled by the dead. To cut this road leading to the Jordan was a matter of supreme importance, and Lieut.-General Sir Philip Chetwode, commanding the XX Corps, ordered his troops, more especially the 53rd Division, to reach and hold it regardless of fatigue. They pushed on through the night and through the next day. By noon the 10th Division were close at hand and the 158th Brigade of the 53rd Division, having cut the two most southerly ways of escape, were also within sight of the objective. Then they were bidden to halt, for to press forward was no longer necessary. The vital road had been cut, and it was the R.A.F. which had cut it.

The events of the 21st September 1918 marked the climax of the campaign. On that day the aircraft of the Palestine Brigade wrote the first words of a new chapter in the long, sad history of war and shewed the dreadful possibilities of destruction which lie in the possession of air power. It was soon after dawn that two Bristol fighters saw much Turkish infantry and many guns moving in a confused but dense stream through the Wadi el Far'a. By 11 a.m. it was becoming choked with their columns, hard pressed in the rear by the advancing British. The road wound for some miles through the narrow defile at the end of which lay open country and comparative safety. By then two bombing attacks had already been made, but now they were to be increased until two bombers every three minutes should be in the air above the road, and six arrive every half-hour till dusk. The attacks endured, in fact, but sixty minutes. No longer time was necessary to achieve the destruction of all within the trap. Up and down the wadi flew the Bristol fighters of No. 1 (Australian F.C.), the D.H.9s of No. 144, and the S.E.5As of No. 111 and No. 145 Squadrons. With three Corps squadrons to aid them they dropped in that short space of time nine and a quarter tons of bombs and fired fifty-six thousand rounds. In all, eighty-eight bombing and eighty-four machine-gun attacks were made. 'I dived and fired continually on the thickest part of the column. . . . 'Four direct hits, one in a body of cavalry roughly fifty strong . . . less than six got up and ran away.' Sights such as these met the eyes of the pilots, not once but many times. It is small wonder that they were made physically sick by their dreadful duty. For in no wise could the Turks escape, and the scene rose to a climax of horror as more and more bombs fell and more and more bullets struck the congested mass. In a few minutes a barrier, blood-stained and impenetrable, of smashed lorries and wagons choked the head of the pass. Behind it horses and mules ran screaming through the angry dust to plunge into one or other of the deep ravines, there to be joined by wrecked lorries, their drivers dead

'THE BIGGEST AEROPLANE IN THE WORLD'

at the wheel. Here and there were to be descried men upon their knees with hands upraised imploring mercy. One or two, hardier and more courageous than their fellows, would scramble up the red sandstone cliffs, soon to be dyed a deeper shade, and open fire with rifles. Two machines were lost in this way, but the rest passed scathless about their grim business till at last all was still. Some days later there were counted in that valley 100 guns, 55 lorries, 4 staff-cars, 912 wagons, and 20 water-carts. Of the men and horses the number who perished was many thousands, how many is not exactly known.

While Allenby's regular troops were driving all before them, the irregular Arab forces under Feisal, with Lawrence as his right-hand man, were playing their part. The plan provided that they should attack the important junction of Deraa where the Palestine and Hedjaz railways met. There had long been operating with them X flight of No. 14 Squadron under Captain F. W. Stent who, among other accomplishments, spoke fluent Arabic. For weeks before the final battle began, the Arabs had been hampered in their movements by the attacks of German aircraft able to operate with some degree of impunity, for they were beyond the range of the main R.A.F. force and had opposed to them but two Nieuport Scouts, subsequently reinforced by a single Bristol fighter.

On the opening of the offensive, the main Arab force was at El Umtaiye but was prevented, largely by the air activity of the enemy, from pushing forward. When on the 21st September Lawrence was apprised of the great scale of the advance, he flew back to General Headquarters where he urged that the full co-operation of the Arabs could certainly be secured if only aircraft could be made available. The difficulties were great, for how were they to be supplied? Salmond solved this problem by risking the apple of his eye, the Handley Page. The next day two Bristol fighters and a D.H.9 arrived to join the Arabs who had abandoned El Umtaiye, where they had suffered from bombing, for Umm es Surab nearby. Here a brisk air-engagement was soon fought, two German two-seaters and a Pfalz Scout being shot down. On the next day Lawrence records that, driving in Feisal's green Vauxhall, he was stopped twenty miles short of Umm es Surab by 'a single Bedawi running southward all in a flutter, his grey hair and grey beard flying in the wind. . . . Raising his bony arms he yelled "the biggest aeroplane in the world" before he flapped on into the south to spread his great news among the tents.' On arriving at the camp Lawrence was confronted by the Handley Page, 'with Bristols and gas like fledglings beneath its spread of wings'. It was surrounded by Arabs whose opinion concerning it was very definite. 'Indeed and at last they have sent

us', they said, 'THE aeroplane, of which these things were foals.' It carried petrol, oil, and other indispensable supplies, and thereafter the Arabs were no longer without effective assistance from the air.

In their advance, now in the general direction of Damascus, they co-operated with Major-General Sir E. W. C. Chaytor's forces moving against the Turkish Fourth Army east of Jordan. His men were sustained from the air by the same squadrons as had attacked the Wadi el Far'a, and their bombing and machine-gun attacks had a most demoralizing effect on the retreating Turks. By the 28th, the Turkish general in command was ordered by a message dropped from the air to surrender or be bombed. He wisely chose the former course, and soon he and the remnants of his army, together with fifty-seven guns, were in our hands.

Five days after the opening of the battle, the advance on Damascus was begun. On the morning of the 1st October the city was entered by Feisal and his Arabs, and thereafter Turkish resistance was virtually at an end. The victorious troops of Allenby moved forward steadily through Syria, occupying Tripoli on the 13th, Homs on the 15th, and Aleppo on the 25th. Throughout this rapid advance they received all the support that was necessary from the air, the fighting squadrons being supplied temporarily by the Corps squadrons which transported oil and ammunition from back areas to the forward landing-grounds. On the 31st October Turkey obtained an armistice and the long struggle was over. Allenby's triumph was complete.

While these things befell in Palestine, farther to the east in Mesopotamia, Persia, and on the shores of the Caspian Sea, fighting was also in progress. Throughout March and the subsequent spring of 1918 the German offensive on the Western Front caused us to mark time in the East. Moreover, April was a month of heavy rain and wind which made flying difficult if not impossible. Nevertheless something was accomplished, for the efforts of the Germans to stir up trouble among various frontier tribes on the Persian border were brought to nothing by the R.A.F., the morale of the Sinjabis being broken by a machine-gun attack from four aircraft, delivered on the 25th April. The operations against the Turks in the area south of Kirkuk to the east of the Tigris were equally fruitful, the aircraft of Nos. 63 and 72 Squadrons being active throughout the campaign. A particularly successful feature was the co-operation achieved by the R.A.F. with the cavalry in an attack on the 27th April, when the S.E.s of No. 72 Squadron flew above the charging horsemen, bombing and machine-gunning the Turks with admirable effect. Kirkuk itself was reached on the 7th May and Tikrit was occupied soon after. A day or two after its capture, Kirkuk was bombed

FLYING FOR DUNSTERFORCE

by a few German aircraft and among the casualties were twenty-six mules. Food was short, and the medical officer who, in addition to his normal duties, was required to supervise the catering, made a particularly rich broth from their stewed remains. A riot among the starving Armenian inhabitants of the town was quelled with difficulty when they discovered the nature of its ingredients.

Soon afterwards 'Dunsterforce', under the command of Major-General L. C. Dunsterville was formed to co-operate with certain Russian troops still engaged in battle with the Turks in Trans-Caucasia. Two Martinsydes from B flight of No. 72 Squadron accompanied the expedition and were particularly useful against a fierce local tribe, the Jangalis. They were next in action at Baku itself, whose Russian garrison had been reinforced by a platoon of British troops. The town was soon in a state of siege but held out, and for six weeks the Turks were denied access to the important Baku oilfields. The two pilots of the Martinsydes, Lieuts. M. C. Mackay and R. P. P. Pope, fought a number of successful actions with the enemy until their machines were destroyed, a misfortune which led them to join the infantry. Their work was much appreciated, and the infantry commander was able to say later on that 'this small detachment of the R.A.F. reduced the two Turkish divisions south of Tabriz to chaos in a manner comparable with that of Allenby's very much larger operations in the Jordan valley'. Thus in an obscure corner of the world, where the situation was as confused as its trackless hills, did air power show itself once again to be a deciding factor in war.

In Mesopotamia itself the story was the same. Throughout the summer of 1918, when the torrid climate made operations on land impossible, the R.A.F. took a large number of photographs which enabled accurate maps of the country to be made. The campaign, of which the objective was Mosul on the upper waters of the Tigris, opened in the middle of October and was everywhere successful. The Turks found it impossible to conceal their movements from the sharp eyes of observers in the air, and after their defeat at Sharqat the road to Mosul lay open, though the town did not actually come into our hands until the Armistice had been concluded.

In the Eastern theatre of war the R.A.F. abundantly justified its existence. The same is true of its operations in Macedonia and Italy. On the first of these fronts the position had long been difficult, for lack of reinforcements made mastery of the air impossible till April 1918, and it was not until August, nearly a year after he had asked for them, that Milne received a number of badly needed bombers. On the 18th June General Franchet

d'Espérey took over supreme command and began to prepare for an offensive. The preliminary work of reconnaissance and photography was carried out in July and August by the R.A.F., who also attacked aerodromes, railheads, and dumps with bombs. Into the details of the general assault it is not necessary to enter. All that need be said is that the task allotted to the British army was exceedingly difficult. It was ordered to carry out a secondary attack on the Bulgarians between Doiran and the Vardar river, the main offensive being entrusted to the Serbian army. Helped by three squadrons of the R.A.F., the assault was launched on the 18th September against positions of very great strength held by a resolute foe who would not give way despite the victory of the Serbs on his flank. The R.A.F. were very active, sending one hundred and fifty-one calls for gunfire on the first day and one hundred and twenty-one on the second. After two days' heavy fighting there was a lull during which air reconnaissance shewed that the enemy, though he had successfully held out against us, was now in retreat. On the next two days reconnaissance flights were multiplied, and on the 24th September it was possible to report that the enemy was moving northwards with all his strength. Signs of demoralization became apparent after bombing attacks carried out by Armstrong Whitworths and D.H.9s, which soon turned their attention to the Kryesna road and pass, which, choked as they were with transport, provided ideal military targets. In a day or two the Bulgarians, having suffered heavy casualties, laid down their arms. Subsequent inspection of their main road of retreat shewed 'signs of the indescribable confusion that must have existed . . . guns of all kinds, motor-cars, machine-guns, rifles, and every kind of war material abandoned. Dead animals are strewn everywhere, indicating that our R.A.F. must have contributed largely in bringing about this state of things'.

To tell the story of what happened on the Italian front, it is necessary to go back to October 1917. On the 23rd of that month two Italian Corps, long stationed at Caporetto, stood ready to retreat at the first sign of hostility on the part of the Austro-German army opposite. On the next day they did so, for the enemy attacked in force and in a fortnight had thrust the Italians far back to the line of the Piave. While this headlong flight was in progress the British and French were taking hasty measures to come to the help of an ally never an asset and now a liability. As air reinforcements, No. 28 Squadron flying Sopwith Camels and No. 34 flying two-seater R.E.8s were at once sent to Italy and were followed by two more. By the end of November 1917 the R.F.C. was in action against Austrian and German pilots, to whose skill, confidence had been added by the behaviour of their Italian opponents.

While the British land forces were settling down to trench warfare, which was to continue through the winter of 1917, the Flying Corps carried on their usual tactical duties, among which reconnaissance and photography were predominant. They were not always allowed to do so in peace and there were several combats. To damp the ardour of the enemy his aerodrome at San Felice was twice bombed in the middle of December, and in retaliation our aerodrome at Istrana was attacked on Boxing Day. The raid had a number of peculiar features. 'I could hardly believe my eyes', says an eye-witness. 'About five miles away, flying at all heights . . . was the most heterogenous collection of aircraft I have ever seen. Making no attempt to keep together . . . thirty or forty Austrian machines were slowly approaching us. . . . Every few hundred yards one would drop his bombs and make for home. Finally about twenty reached the aerodrome and bombed it. . . . They did not go straight back but, becoming more dispersed, they wandered all over the country at about a thousand feet.' The damage caused was very slight and the aerodrome was operational again within an hour and a half. A number of the officers stationed there went out in the afternoon to look for crashed Austrian machines. They soon found one 'with the pilot apparently dead in his cockpit. On approaching it we heard snores and found that the pilot was merely asleep. His machine-gun was loaded so we pointed it at him and awakened him.' It appeared that he was suffering from the effects of too good a Christmas dinner. He was not alone. The pilots of five other machines brought down were captured and found to be 'not quite sober'.

Raids by ourselves and the enemy occupied January and February 1918 and gradually the R.A.F., having taken the measure of their often light-hearted opponents, obtained the mastery. In the spring the British forces were moved to a mountain sector in the Asiago plateau, and it was just after this move that Lieut. Alan Jerrard won the Victoria Cross for not hesitating, with two companions, to fight nineteen of the enemy. He destroyed three before he himself was forced down and made a prisoner.

In June the enemy's air activity increased, especially along the Piave front and seemed to foreshadow an attack. On the 15th it was launched. The British line held, so did the French, but against the Italians the Austrians were more successful. A number of their units crossed the Piave over pontoon bridges. After reconnaissances by No. 45 Squadron it was decided to bomb them with every aircraft available. Thirty-three Camels did so in the afternoon, releasing their bombs from a height of only fifty feet. One of the bridges was cut in two places, and its

AUSTRIA DROPS OUT

pontoons, swept by the fierce current, crashed into the other bridge and broke it. Two hours later another bombing attack was delivered, this time on the Austrian troops caught on the river bank. These actions were singularly successful for they prevented the Austrian attack from developing. In the event bad weather ruined it, and it cost Austria twenty thousand prisoners and many guns.

The rest of the summer passed comparatively quietly, the weeks being occupied by the Allies in building up their strength for the offensive planned to take place in the autumn. On the 27th October the whole line moved forward and in a few days the victory of Vittorio Veneto was won. The share taken in it by the Royal Air Force was somewhat curtailed by bad weather, but as soon as the Austrians began to break they were relentlessly pursued from the air. In the final advance the Air Force dropped 20,000 lb. of bombs and fired 51,000 rounds, losing in all but seven aircraft. Austria, like Turkey and Bulgaria, had been utterly defeated.

While all this heavy fighting was in progress on the various fronts in Europe and the Middle East, the war at sea continued with a vigour, unremitting if unspectacular. In the Mediterranean the Air Forces engaged were divided between Gibraltar, Malta, the Adriatic, the Aegean, and Egypt. In all these subsidiary theatres the problem was the same, how to counter the activities of submarines. On the whole, the methods used achieved success, and by June 1918 the losses of Allied shipping, due to submarine attack in those waters, had been reduced by one half. This happy result was brought about largely by the adoption of the convoy system, which afforded the R.A.F. unlimited opportunities of escort. The barrage in the Straits of Otranto also contributed to a certain extent to the protection of our merchantmen, while the seaplane base at Taranto justified its establishment again and again. The attacks made on the U-boat bases, notably at Cattaro, were of little avail, however, for the weight of bombs dropped was not heavy enough to inflict real damage, and the value of the air services lay rather in patrols which forced the submarines to remain beneath the surface and thus reduced the field and duration of their operations.

Farther north in home waters and in the North Sea, the battle raged more fiercely. The convoy system made it difficult for U-boat commanders to attack successfully in the open sea; in the early months of 1918, therefore, they formed the habit of moving close inshore and lying in wait for individual ships making for port after the dispersal of the convoy. To counteract this manœuvre, off-shore patrols were instituted. Since more modern aircraft were in great demand on the battle-front, they had to be

NORTH SEA ENCOUNTERS

carried out by obsolescent D.H.6s used for the training of pilots. They were based at various points round our coasts, from the Humber to the Irish Sea, and did remarkable work in difficult and often highly unpleasant conditions. Monotonous though the life of their pilots might be, their perseverance at length had its reward. Before the war was over the Admiralty expressed appreciation of the work done.

In addition to the inshore patrols, the spider-web patrols were maintained and augmented, and the number of miles flown by sea- and land-planes on this duty increased from 864,497 in 1917 to 3,504,435 in the following year. Altogether 117 attacks were made by aircraft and 13 by airship. Some 6 U-boats were destroyed and about 25 damaged.

The R.N.A.S. and, after the 1st April, the R.A.F., were not, however, content with purely defensive measures. To attack the enemy in his bases was obviously the best course if it could be adopted. The Zeppelins and seaplanes of the German Air Force could with advantage be assaulted. The place and occasion were not difficult to find. In order to confine the U-boats as far as possible to their bases we had laid and maintained a series of minefields in the Heligoland Bight. From time to time lanes through these were swept by German trawlers which had to be afforded the protection of aircraft. Flying-boats from Yarmouth and aircraft from H.M.S. *Furious* did their best to interfere with these German patrols. In May, for example, a flying-boat from Killingholme encountered the Zeppelin L.62 at a moment when she was carrying out a routine flight over the mine-fields. After a brisk engagement fought at between eight and nine thousand feet, the Zeppelin was hit and presently made off 'in a crabwise fashion emitting much smoke'. She eventually blew up and there were no survivors. Trials with lighters towed, if necessary, at a speed of thirty knots shewed that it was possible to transport aircraft across many miles of sea and it was soon obvious that, if a lighter could be brought within air range of Germany, her Zeppelins and seaplanes might be attacked with advantage. Every endeavour was made with this end in view, and a number of small operations took place off the German coast between March and May 1918. The Germans were active in their defensive measures, making use of seaplanes based on List, Borkum, Heligoland, and Nordeney, and also on carriers. The machines used were powerful, being for the most part the Friedrichshafener and the Brandenburger, and they prevented the R.A.F. from having matters all their own way.

The Admiralty judged that the menace of the Zeppelin was not to be dissipated solely by defensive action. These large and far from handy craft must be attacked in their own bases, notably at

FLYING FROM LIGHTERS

Tondern. Two special flights equipped with Sopwith Camels were accordingly formed and many rehearsals for the purpose conducted. Their parent ship was the *Furious*, and on the 17th July, sailing with the First Light Cruiser Squadron, she reached a position eighty miles north-west of Tondern. Two flights of Camels, numbering seven aircraft in all, each carrying two 50-lb. bombs, took off at three in the morning. The first three pilots, including Captain W. D. Jackson, the leader, scored hits on one of the large airship sheds, and one of the pilots, mistaking the ammunition store for the home of a Zeppelin, dropped a bomb on it from a height of seven hundred feet and set it on fire. The second flight, led by Captain B. A. Smart, was equally successful. A second shed was hit and burst into flames. It was subsequently learnt that the Zeppelins L.54 and L.60 inside them had been burnt to ashes.

Attempts were also made to harass the enemy mine-sweepers by using motor-boats provided with air cover. The boats were carried to the scene of operations on board destroyers or cruisers, which remained in enemy waters while they were about their business and then brought the boats home again. The aircraft to cover them were carried in lighters from which, after a number of hazardous experiments, pilots learnt to take off without mishap. Samson, who had begun the war in command of the armoured cars which had done such fine work in Flanders, was the first to make trial of this new method. In his first attempt he narrowly escaped death, for the skids of his Sopwith Camel overran the trough and the machine cart-wheeled over the bows of the lighter, which then ran it down. The pilot was rescued with great difficulty. His misfortune led to a change in the launching methods used, wheels being substituted for the skids.

The most successful of these expeditions took place on the 11th August, when Lieutenant S. D. Culley took his Sopwith Camel off the deck of a lighter and attacked a patrolling Zeppelin. One prolonged burst from his gun was sufficient and she went down in flames. Some miles away Rear-Admiral Tyrwhitt on his bridge was watching the encounter through glasses. As soon as the first flames lit the sky he turned to his Flag Lieutenant and made the following signal to the ships under his command: 'Flag-general, your attention is called to Hymn No. 224, verse 7'. Soon captains and chaplains were hunting through Hymns Ancient and Modern. The reference, they found, was to the words:

O happy band of pilgrims,
Look upwards to the skies,
Where such a light affliction,
Shall win so great a prize.

It is interesting to note that the position of this Zeppelin had been

GERMAN SEAPLANE SUCCESSES

exactly plotted by officers in the Admiralty in Whitehall miles away and then sent by wireless to the Admiral. Lieutenant Culley's successful attack was thereby greatly assisted.

On that occasion, though a Zeppelin was destroyed, the motor-boats suffered heavily. They were attacked by German seaplanes and fought to the last round and the last drop of petrol. Not one got back, but several reached Holland where their crews were interned. An attempt to avenge their fate was made on the 21st October but heavy seas damaged both the shore-based flying-boats and the Sopwith Camels in the lighters and none of them was able to come into action. Such disappointments were not unusual in the Four Years War. Conditions in the North Sea made flying in aircraft primitive to a degree if judged by modern standards, uncertain and often very hazardous. The advantage lay with the enemy who possessed excellent land bases in the Frisian Islands.

In the southern area of the North Sea the German aircraft composing the unit known as *Flanders I*, based on Zeebrugge, gave great trouble. Whenever possible they shewed fight and scored a number of successes. As late as July 1918 we were still using B.E.2cs in that area, and to fly them against the high-speed float type seaplanes of the enemy was to court disaster. Even in the company of Short seaplanes such aircraft proved no match for the enemy. An engagement fought on the 7th June shews the conditions under which the R.A.F. were required to operate. A B.E.2c, escorted by a Short seaplane, was attacked by five German seaplanes and a duel was fought at a height of only thirty feet above the water. The Short, forced down, alighted on the sea near a number of our motor-boats, which opened fire. The Germans retorted with vigour, however, and pouring bullets into the seaplane from a height of a few feet destroyed it. In the following month the Germans again had the best of a battle fought off the Kentish Knock.

So active were the pilots of *Flanders I* that Admiral F. C. D. Sturdee, commanding at the Nore, was compelled to point out in an official dispatch that 'the present situation . . . is so obviously unwarlike that it would seem only to require being mentioned to ensure it being rectified'. The fact was, however, that the problem of supply had not yet been solved even at that late stage of the war. Despite every effort, the Air Staff could not equip our coastal stations with aircraft able to cope with the faster and better German machines. Of these there were never more than thirty, but since they were well-handled they proved a great nuisance, shooting down twenty-six Allied aircraft, destroying six merchant vessels, some with torpedoes, a British submarine, and two non-rigid airships.

ZEEBRUGGE AND OSTEND

Still farther south, operations on the Belgian coast had continued without pause since the beginning of the war. The creation of the Royal Air Force caused a reorganization at Dover and Dunkirk, but the position was never very satisfactory from the point of view either of the Admiralty or of the War Office. The first wished, very naturally, to use the aircraft at these bases for the protection of shipping and the long-range bombing of objectives in Belgium and Germany, while the second did their best to ensure that they would play a part in the desperate battles in Flanders. That these were critical was duly recognized by Vice-Admiral Sir Roger Keyes, who had succeeded Vice-Admiral Sir Reginald Bacon in command of the Dover patrol, and he eventually placed two fighter squadrons at the disposal of the army.

The Air Council, formed three months before the creation of the Royal Air Force, took what was possibly a wider view. It was concerned to use air power not only in direct support of the naval and land operations, but also against the enemy in his own home. It wished, therefore, to establish two bombing forces, a Northern and a Southern, of which the first would be composed of the squadrons at Dunkirk with objectives on or near the Belgian coast, and the second to be based in Northern France with orders to bomb Germany. The Northern force never materialized, for pressure on our armies in the spring of 1918 made it necessary for it to be diverted to the main battle-front, and production failures at home prevented the building up of a reserve which might have been used for the purpose which the Air Council had in mind.

In the spring of 1918 the main work of the Dunkirk bomber squadrons was connected with the naval raids on Zeebrugge and Ostend. In the renowned exploit of St. George's Day 1918, when the harbour at Zeebrugge was blocked, the part played by the R.A.F. was not so great as had been hoped. At that time German pressure in Flanders was very fierce, and the Air Staff at one time feared, possibly not without reason, that the base at Dunkirk might fall into the hands of the enemy. Steps were taken in consequence to disperse the bomber squadrons, and only a limited number of these were therefore available when Keyes made his attack. Bad weather, too, was constantly interfering with the operations and preventing the night bombers from taking the air, the first raid on Ostend being a case in point. But on the second, seven Handley Pages of No. 214 Squadron bombed the harbour just as the *Vindictive* was approaching it and successfully illuminated the objective with parachute flares. Late in the evening before, in semi-darkness, Major R. Graham discovered that the buoys off Ostend had been removed. The warning he conveyed

THE DUNKIRK BOMBER SQUADRONS

was timely and enabled a special light buoy to be placed in position to form a vital guide for the attacking squadron.

During the weeks following the Zeebrugge and Ostend raids an intermittent controversy went on between the Admiralty and the War Office concerning the use to be made of the Dunkirk bombing squadrons. Keyes pointed to the fact that the blocking of Zeebrugge harbour and the partial blocking of that at Ostend had caused a large number of enemy submarines and other vessels to remain at Bruges, where they offered a tempting target. Haig, on the other hand, maintained that he was too hard pressed to release any of the bomber squadrons lent to him, and his views prevailed. With such bombers as he could collect, Keyes attacked Bruges and Zeebrugge during May, dropping thirty-six tons on the first and thirty-two on the second, without appreciable effect.

One attack by a Handley Page on the 28th must be noted because of the novel method employed by its pilot, Captain C. H. Darley. His target was the lock-gate at Zeebrugge, and he glided silently towards it, releasing three 520-lb. bombs from a height of two hundred feet. Two of them fell into the lock, the third near the northern gate. The Handley Page was followed by a D.H.4, one of whose bombs hit the target. It was shot down and its pilot and observer taken prisoner.

The Germans retaliated whenever possible, and the Dunkirk area was subjected to a large number of bombing attacks in which the aerodrome at Coudekerque was put out of action. The counter-blow of the R.A.F., delivered on the 13th August, took the form of a heavy raid on Varssenaere aerodrome by fifty Sopwith Camels, including American squadrons. They achieved surprise, caught three flights of Fokkers on the ground, and did them severe damage. Heavy casualties were caused and, in addition to the Fokkers, between twenty and thirty aircraft were destroyed in the hangars. Special attention was paid to the quarters of the German officers, in which panic soon reigned; they and their women were seen running about in great disorder. This attack cost not a single machine.

The Southern Independent Bombing Force was an attempt to make use of the air weapon against the enemy's centres of production, the object being to paralyse his output of munitions. This was more easily conceived than achieved. By the beginning of 1918 technical difficulties were no longer insurmountable. Neither the D.H.4, with a maximum duration of five and a half hours, nor the D.H.9, with its unsatisfactory 200-h.p. B.H.P. engine, was the right type of machine for long-range bombing, though this did not prevent their use, but the Handley Page and the D.H.9 were powerful enough to carry the war into the enemy's territory. The political difficulties, however, were formidable,

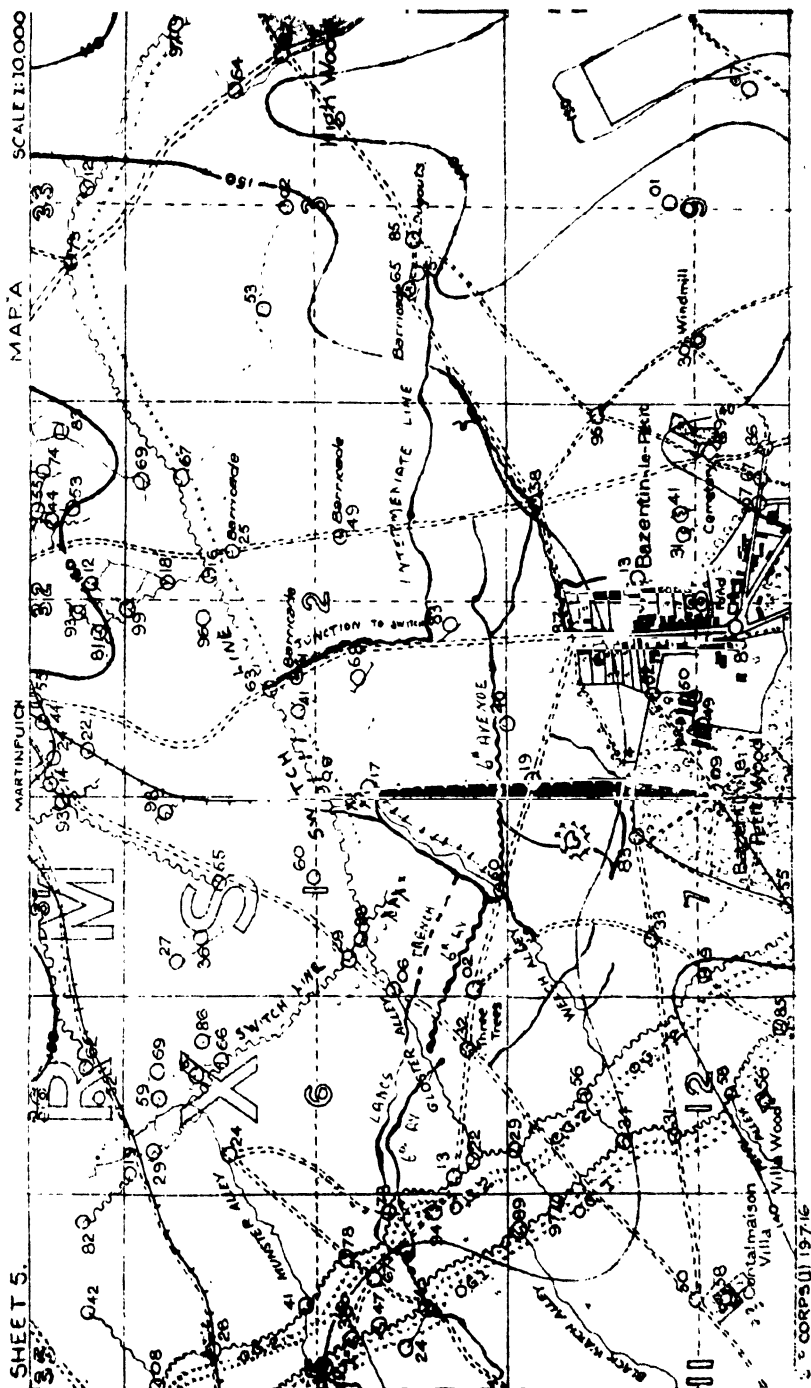
AN INDEPENDENT BOMBING FORCE

and were not surmounted until the 26th October 1918, when Trenchard, who, since June, had been in command of the Independent Bombing Force, an exclusive concern of the R.A.F., was officially appointed Commander-in-Chief, under the supreme control of Marshal Foch, of the Inter-Allied Independent Air Force. Like so many matters which provoke political controversy, the origin of both these independent forces was a grain of mustard seed, in this case a communication from the King of Spain made in February 1918 and ostensibly designed to induce both belligerents to undertake not to bomb open towns. The British Government was sympathetic until it became obvious that the proposal was a German manœuvre to secure an agreement whereby only towns within twenty miles of the Front should be attacked. To adopt this suggestion would have meant the destruction of many French and Belgian cities while those of Germany would have remained unharmed.

The creation of the Royal Air Force as a separate Service with a separate Ministry behind it led almost immediately to the logical proposal that part of its resources should be used to form an independent bombing force. This course was strongly pressed by Weir, who had succeeded Rothermere, and by Sykes, who had taken Trenchard's place as Chief of the Air Staff. At first it seemed there would be no difficulty. Clemenceau signified his consent and instructed General Duval, in charge of the French Air Services, to give all possible help. French logic, however, boggled at the word 'independent'. 'Independent of whom? Of God?' asked a French general, when he heard of the proposed Force. Unity of command in the field had been achieved only with the greatest difficulty, and now the British, whose moods were always incalculable, were seeking to upset it in the air—or so it seemed. In vain did Sykes explain that the full air requirements of the armies in the field would always be met and only the surplus allocated to Trenchard's proposed command. The French remained unimpressed. What authority could say what the limits of those requirements should be? Was not that commander the most successful who put everything he had into battle? So the wrangle continued, the proposal being referred more than once to the Supreme War Council, which more than once shewed a marked reluctance to take any decision on it. Nor were there lacking persons of high authority at home who doubted the wisdom of creating an independent air force composed solely of R.A.F. machines and crews. The question was a sequel to the controversy, already described, which surrounded the creation of the Royal Air Force. Its independence, so the argument had run, would be a menace to the Navy and the Army. These older Services would be deprived alike of sufficient aircraft and sufficient

SOME HISTORICAL DOCUMENTS
OF THE 1914-1918 AIR WAR

1. The first air reconnaissance of 1914-18
2. The first air casualty of 1914-18
3. Captain Pearson's sketch map of Bazentin
4. Combat report by Lieutenant Ball
5. Combat report by Captain McCudden
6. Combat report by Captain Mannock



Captain Pearson's sketch of enemy positions near Bazentin, July 22nd,

Combat report by Second-Lieutenant A. Ball, July 3rd, 1916
Crown copyright reserved

Combat report by Captain J. B. McCudden, with annotations
by Lord Trenchard

Combat report by Captain E. Mannock, June 1st, 1918

(written in pencil)

THE USE OF STRATEGIC BOMBING

control to enable them to conduct operations. It had been with great misgiving that those who upheld this view had seen their opinions overridden, and now hardly had the new service been founded when its chiefs proposed to attack the enemy on their own without reference to Foch or Haig or any one else. These critics failed, or did not wish, to realize, not only that an independent bombing force could be switched to any target within range at any moment at the request of the naval or military commanders, but also that its work far behind the enemy's lines was of direct importance to the battle. The destruction of factories where the arms and munitions used by his troops were manufactured, the cutting of communications by which alone those arms and munitions could be brought to the front, were major contributions to victory. Haig realized this hardly at all. He could look no farther than objectives immediately outside the range of his guns. That others of even greater, though possibly of less direct, importance, lay on the farther side of the Rhine was as far beyond his mental as it was beyond his physical vision. Yet in the end the Air Council gave way. After threatening to base the Independent Bombing Force only in England outside Foch's jurisdiction, it eventually agreed to subordinate Trenchard to him. The result, as they foresaw, was that towards the end of the war the Force, or a large part of it, was many times used as a long-range gun on targets only a few miles behind the enemy's lines. This development, however, was still in the future when the first efforts to bomb the Germans in their own country were made.

The VIII Brigade, a bomber force which had originally formed the 41st Wing and had begun operations on the 17th October 1917, was formed on the 1st February 1918. It consisted of No. 16 naval squadron, No. 100 night bomber squadron, and No. 55 day bomber squadron reinforced at the beginning of May by No. 99. Altogether, between the 17th October 1917 and the 6th June 1918, when the Independent Bombing Force came officially into existence, it carried out fifty-seven raids on military targets in Karlsruhe, Mannheim, Cologne, Mainz, Stuttgart, Coblenz, Thionville, and Saarbrücken. These attacks, though the damage they caused was very small compared with the standard of to-day, were made at a time when German morale was on the downward grade. The same phenomenon, a falling-off of production, as had been observed in England in similar circumstances, was soon noticeable in Germany. In one month a single factory reported that its output had been reduced by three thousand tons because thirty-five air-raid alarms, all of them false, had been sounded. Unlike the British worker, however, who quickly recovered from his momentary dismay, the Germans plunged deeper and deeper into Teutonic gloom. Intelligence reports reaching us in July

GERMAN FIGHTER OPPOSITION

1918 shewed clearly that bombing and shortage of food were the twin causes of the ripples of depression spreading over Germany, soon to change into waves of despair. The murmurings of the German people found an echo in the Reichstag, where questions began to be asked. Soon the German High Command was compelled to bring back, to protect German cities, fighter squadrons urgently needed at the front. Yet the number of civilian casualties caused by our bombing was not great, 746 being killed and 1,843 injured, about half those inflicted on the citizens of this country.

When at the beginning of June Trenchard took over the Independent Bombing Force, which in October was to become the Inter-Allied Independent Bombing Force, the raids increased in number and range. On the morning of the 16th July, for example, twelve aircraft of No. 99 Squadron, followed by twelve of No. 55, attacked the station at Thionville and had the good fortune to hit an ammunition train which blew up and caused very great damage. German fighter opposition soon became severe and was especially fierce on the 31st when, out of twelve D.H.9s of No. 99 Squadron which had set out to attack Mainz, four were shot down before reaching Saarbrücken, and three more after bombing it. Only five returned to base and, of these, three came back early with engine trouble and took no part in the raid. It was soon after this attack that the D.H.9 was withdrawn. In August 1918 the main damage was to Frankfurt by day and Cologne by night. An assault by two Handley Pages on the Badische Anilin und Soda Fabrik at Mannheim on the night of the 25th-26th was particularly daring. Both machines came in low through the searchlights and the barrage, Captain W. B. Lawson, the pilot of the first, attacking from two hundred feet, and Lieut. M. C. Purvis, the pilot of the second, from five hundred. In an attempt to keep the bombers in their rays, the searchlights followed them down and thus obligingly illuminated the target, so that the British pilots were able to drop their bombs with great accuracy among the factory buildings.

As the Allied offensive in the West began to develop, much of Trenchard's force was often diverted from long-range targets, to hit which was its true purpose, to objectives closer at hand of immediate importance to the armies. Repeated raids were made on the Metz-Sablon railway, on Mezières, and on aerodromes. In October the Handley Pages were armed with the largest bomb used by the Allies in the Four Years War. It weighed 1,650 lb. and each machine carried one. A bomb of this size dropped on Kaiserslautern almost entirely wiped out a small-arms factory; another which fell in error on Wiesbaden caused the local fire brigade to work continuously for three days and nights. German indignation at this attack on what was then an open town was

PREPARING TO BOMB BERLIN

very great, but our enemies forgot then, as they were to forget in the next war, that the country which has recourse to long-range bombing with all its consequences to civilians, is making use of a dangerous and explosive boomerang. The lamentations of the citizens of Wiesbaden were but the echo of those which had gone up from King's Lynn and Yarmouth three and a half years before. That the apostles of total war find difficulty in holding strictly to their beliefs when called upon to suffer their effects, is a phenomenon to be remarked in both the great wars of the present century.

There was one target which Trenchard had constantly in mind. German Zeppelins and aircraft had done their utmost to concentrate on London. For them it was the key city, the bombers' Mecca. To attack it hard enough and often enough would be to strike a fierce, perhaps a mortal, blow at the heart of the foe they feared the most. How they tried and failed has been set down in Chapter XIII; but there can be no chapter telling of our own attempts to reverse the process and to bring the war to the capital of the German Reich, for the simple reason that an armistice was proclaimed before we were quite ready to do so. Had the Four Years War endured but a week longer, and had the weather between the 11th and 18th November been favourable, bombs would have fallen on Berlin twenty-three years earlier than they did. Two bomber wings, the 86th and 87th, were then in process of formation, the first to operate from Bircham Newton in Norfolk, the second from Prague, in what was then part of the Austrian Empire. The aircraft chosen for the task was the V.1500, known as the Super-Handley Page. Maintained aloft by four engines, it could transport to the chosen target a crew of six with thirty 250-lb. bombs. The first of these machines was built in conditions of the greatest secrecy by the firm of Harland & Wolff of Belfast early in 1918. It crashed in June and production was delayed in consequence, so that the second was not ready until October, when it was at once pronounced 'very comfortable to fly'. Only three of these machines were ready by the date of the Armistice.

Not only could these Handley Pages be used from England, but by the late autumn of 1918 it was possible to find bases for them in the various states comprising the Austro-Hungarian Empire, which had surrendered on the 4th November. Prague was chosen as the most suitable and Trenchard had arranged to send to that city a train carrying a month's supplies for six Handley Pages, when the war came to an end. What might have happened and what effect the bombing of Berlin in 1918 might have had upon its arrogant, war-loving inhabitants, it is hard to say; having endured the certainty of danger and the possibility of death or

THE CLIMAX REACHED

injury, the Berliners might have learnt a lesson which it is just possible they would have remembered in 1939. This is pure conjecture. The facts are that they had to wait until 1941 for their first bombs and until 1943 and 1944 before the full horrors of bombing as a method of warfare were brought home to them by machines of infinitely greater power.

So in all theatres and in every branch of air warfare the climax was reached in the autumn of 1918. By the beginning of November all our enemies save Germany, the most formidable, had been laid low. The Allies had won complete victory over Austria, Turkey, and Bulgaria. By the 11th of the month Germany, too, was in the dust. The part played by the Royal Air Force in putting her there must now be set down.

17. Winged Victory

IT was in the full heat and fury of battle that the Royal Air Force came into existence as a separate entity. On the 2nd April 1918, before it was forty-eight hours old, it received its first instructions from the New Allied Generalissimo. It was ordered to bomb the most important enemy railway junctions, and these were defined as those at Péronne, Cambrai, Aubigny-au-bac, and Douai. Bad weather made the operations difficult, but six squadrons did their best, and No. 102 set a train on fire at St. Léger. The opposition the R.A.F. encountered on bombing, fighting, and reconnaissance work now began to change in character. The Germans adopted mass formations of as many as thirty or forty fighters flying at a considerable height which dived or not to seek combat as they willed. To meet them similar tactics were employed, and henceforward three or four R.A.F. squadrons would fly together, thus providing each other with mutual support.

After their tremendous initial effort the German attacks on the Somme began gradually to die away, and by the 5th April the front was more or less stable. The fighting had been the most severe the war had yet seen, but it had not been decisive. The Germans were not in Amiens; the British and the French armies had not been forced apart, but they had only just survived the onslaught. In the air the enemy's casualties had been very heavy, nor had they made as much use as they might of their flying services. There was no intensive bombing of the retreating British armies. Had this been part of the German air strategy many promising targets would have been discovered. On the 23rd March, for example, every road out of the town of Péronne was blocked by army vehicles, troops, and, last but by no means least, refugees. On the Arras-Albert front 'peasants were fleeing westwards . . . carrying anything that could be saved. . . . They blocked the road with slow-moving carts and barrows. . . . The result was chaos.' So runs a Staff report of the VII Corps.

In fighting, the German airmen failed to lure the R.A.F. low-flying fighter patrols from their object. The result was that the losses inflicted on the German infantry by air attack were, according to Ludendorff, 'extraordinarily high'. The Germans had this excuse, that the very swiftness of the advance was their undoing. Their armies were sweeping forward over ground torn and gashed by so great a multitude of trenches and shell-holes that it resembled nothing so much as a landscape of the moon. Two years before it had been the main battle-field of the Somme, and the mauled earth had had no time to recover. In consequence,

forward landing-grounds for machines co-operating with the advancing German infantry did not exist and could not be constructed. Thus at the very moment when liaison between the air and ground forces was of supreme importance it faltered and then broke down.

Nevertheless, though on the Somme they had not achieved decisive success, there was still much fight left in the Germans. Ludendorff still believed that he could achieve victory; he continued to hold the initiative and with scarcely a pause he struck again. On the 9th April the enemy opened an attack in the area of the Lys; but this time preparations had not passed unobserved. On the 1st April, when it was only a few hours old, the R.A.F. reported extensive enemy movements between La Bassée and Armentières, one observer counting fifty-five trains in two hours. Haig was then unsure of the enemy's intentions and expected him to attack the Vimy Ridge, not realizing that the repulse of the Germans on the 28th March in the high ground before Lens had blasted these hopes. If his supposition were correct, then the forces in front of La Bassée would deliver only a subsidiary attack in order to draw his reserves away from the Vimy region where the real blow was to fall. The air reports, however, told a different tale. Supported by numerous air photographs, they continued to paint a detailed picture of the formidable preparations in progress to assault the British line at a point where the left of the First Army joined the right of the Second. By the 6th April the German concentration north of Aubers was seen to be well advanced. Holding the line in this sector was the 2nd Portuguese Division, the 1st having already been relieved. They were weak in numbers and had ten thousand yards of front to guard. It was decided to relieve them too, but, before it was possible to do so, the Germans were upon them.

As usual, the enemy was favoured with good weather conditions. Between six-thirty in the morning and two in the afternoon on the 9th April fog covered his ferocious attack and prevented the R.A.F. from taking the air. Overwhelmed, the Portuguese broke, and by the afternoon the enemy was across the Lys. Throughout that day the R.A.F. could do little, yet, despite the extremely bad weather conditions, a considerable number of low-flying attacks were made by single-seater fighters, Camels and S.E.5As, and much execution was done. 'The battalions all suffered severely . . . from the British low-flying aircraft which attacked them savagely with machine-guns and bombs. The German pilots were unable to do much in view of the British air supremacy.' So writes the historian of the 202nd (German) Reserve Regiment. Such tactics, even though pursued regardless of cost, could not suffice to defeat so furious an onslaught. The

situation was very critical on the 10th and 11th April, but the 55th Division stood firm at Givenchy and Festubert, and the 9th Division to the north proved equally immovable. Thus Ludendorff failed to extend his front. The crisis came on the 12th April, and proved so severe that it was then that Haig issued his order of the day in which he urged that 'every position must be held to the last man; there must be no retirement. With our backs to the wall and believing in the justice of our cause, each one of us must fight on to the end.'

The R.A.F. put forth a supreme effort. The fine weather had returned and its pilots were in the air from dawn till dusk, flying in all 3,240 hours. Every pilot of No. 201 Squadron, for example, flying Camels, was in action for more than five and a half hours. The bomber formations were very active and dropped altogether 4 250-lb., 392 112-lb., and 2,152 25-lb. bombs on German back areas and lines of communication. Combats were frequent, for the German Air Force did their utmost to support their attacking infantry. It was on this day that Captain H. W. Woollett had singular good fortune. Flying a Camel of No. 43 Squadron, he shot down six German aircraft, three in the morning and three in the afternoon. That bright spring day ended without a decision. Though Ludendorff continued to attack at intervals throughout the following week he could achieve no lasting success. The defence had been just, only just, too strong for him.

The four-day lull which ensued between the first battle of the Lys and a renewed assault in the Somme area, with Villers-Bretonneux as its object, was marked by one event of importance. On the 21st April Captain A. R. Brown, a Canadian of No. 209 Squadron on patrol in his Camel, saw an attack developing on two R.E.8s of the Australian Flying Corps engaged on photographing an area west of Hamel, and flew to their rescue. As he approached at the head of two flights, he perceived fifteen Fokker and Albatros Scouts painted in a variety of bright colours moving swiftly against him. Brown could muster eight Camels, and these soon found themselves fighting for their lives against the fast, well-handled triplanes. One of his pilots, 2nd Lieut. W. R. May, whose first sortie this was and who had strict orders not to become involved in any fighting, turned for home after an indecisive duel with a Fokker. Looking back, he saw a scarlet triplane diving upon him. Brown saw it too and in his turn dived upon the German. The three aircraft came roaring down the sky just above the Australian front-line trenches. As Brown pulled out of his dive he had the scarlet triplane in his sights for a brief moment and his twin machine-guns opened fire. The pilot of the triplane turned in his cockpit and then fell forward; his machine, slipping and staggering, went down and presently

VON RICHTHOFEN BROUGHT DOWN

landed heavily two miles inside the British lines. Almost at the same moment as Brown opened fire two Australian machine-gunners turned their Vickers on to the triplane from the ground and some Lewis gunners belonging to a nearby battery of field artillery also shot at it. When the dead German pilot was withdrawn from his cockpit it was seen that only one bullet had hit him and a subsequent post-mortem shewed that, from the position of the wound, it could only have been fired from behind and in the same plane. Brown duly reported his victory, but it was not until some hours later that he learnt that the pilot of the red triplane was Manfred Freiherr von Richthofen, the famous leader of the famous Circus. The greatest of the German fighter pilots was dead. Save for a short interval in July 1917 when he was recovering from a wound in the head, von Richthofen had been continuously fighting on the Western Front from the 17th September 1916 till the day of his death. He claimed eighty victims.

The day after the attack on Villers-Bretonneux, a second attack was opened on the Lys, and Kemmel Hill was captured. Its defenders were mostly French and were greatly hampered by the mist which yet again enveloped the fighting. Once more, however, the Germans failed to obtain a decision. Though the loss of Kemmel forced a withdrawal of the troops holding important positions in the Ypres salient, it could achieve no more. With its ending the German attacks ceased for the moment. Neither upon the Somme nor upon the Lys had Ludendorff secured the victor's crown and no small part of his failure can be attributed to the Royal Air Force. In the initial stages of each battle the Germans achieved local air supremacy, but they could never hold it, with the consequence that, as soon as the battle went against them, their infantry and guns began to suffer and therefore to lose in efficiency. The first, as has been said more than once, sustained grievous losses from the attacks of our low-flying fighters; the second, deprived of air observation, were unable to perform their proper function and shell vital targets. The problems of air and ground co-operation, which we had tried so hard to solve on the Somme and in Flanders during the two previous years, proved equally difficult of solution for the enemy. It was not until the high summer that they were overcome and it was the Royal Air Force, not the German, which found the means.

Before those days dawned, however, much hard fighting was to be the lot of the French and British armies. Lack of decisive success in the north did not deter Ludendorff from seeking it in the south. His next venture was upon the Aisne. This part of the front had long been quiet and to it, therefore, four British divisions, which had suffered particularly heavy losses in the fierce

THE VALUE OF AIR REPORTS

spring campaigns, were sent for rest and refreshment. They were accompanied by No. 52 (R.E.8) Squadron, but they had not yet settled down to a life of comparative ease when, an hour after midnight on the 27th May, one of the heaviest bombardments of the whole war fell upon them. The German attack, launched at dawn, very nearly succeeded. Two of the four divisions were wiped out, one suffered heavy casualties, and only the fourth, which was in reserve, remained intact. The enemy penetrated the Allied line to a depth of twelve miles and by the evening of the 30th May had reached the Marne. By then, however, Foch had been able to throw sufficient reserves into the fight to stop his further progress.

What happened in this second battle of the Aisne was in part due to the inability of the General Staff, even at so late a period in the war, to judge the value of air reports. At dawn and again at dusk on the 22nd, 23rd, and 24th May the R.E.8s of No. 52 Squadron had all reported distant clouds of dust swirling above the roads in the back areas behind the German front. After the attack it was easy to deduce their cause—heavy artillery and transport moving up in readiness for the assault. It would have been more profitable to have made the deduction at the time, for then the Allied line could have been reinforced and the Germans might not have broken through. True, the general commanding the four British divisions was uneasy when he read these reports and brought them to the notice of the commander of the French Sixth Army, under whose orders he was serving; but his tentative suggestion that an attack might be developing was received with polite incredulity and he took no further action, though a single long-range reconnaissance would have settled the matter.

Fortunately for Britain and France, Ferdinand Foch was accustomed to profit alike from his own mistakes and from those of others. When the next German offensive opened at 3.20 a.m. on Sunday the 9th June, between Montdidier and Noyon, he was ready. A week previously he had become convinced that an assault in this area was imminent, and during the seven days which preceded it he quietly collected adequate air reinforcements from both the British and French services. On the 3rd June eight R.A.F. squadrons moved south to reinforce the French, and formed the IX Brigade. The main battle lasted three days; but though the Germans succeeded in reaching the River Matz, they did so only on a narrow front and never penetrated the main line of resistance. The fighting was, as usual, confused on the ground and sometimes also in the air. On occasion, British and French pilots mistook each other and engaged in combat, and once a British pilot led a formation to bomb what he supposed were Germans, but were in fact the troops of our Ally. These

TO GUARD AGAINST SURPRISE

mishaps, which resulted in unnecessary casualties, shewed once more how important and how difficult it was for Allies to achieve the necessary degree of co-operation.

Impressed by the Allied failure on the Aisne and their success on the Matz, Salmond issued a memorandum to his subordinate commanders in which he repeated one of the most important duties of the Air Service. It was to ascertain the movements and dispositions of the enemy. The approach march of his attacking troops must be discovered, for only by so doing could the exact spot where the blow would fall be correctly gauged. Every likely route was, therefore, to be reconnoitred twice in each night and again just before dawn, when pilots were to fly as close as possible to the ground. 'The responsibility that the British Army is not surprised,' said the Major-General, 'is on the Royal Air Force.'

At the same time great efforts were made to draw up and put into effect a comprehensive bombing scheme. Foch, and the French High Command generally, had always been convinced that the best targets were railways, and the Inter-Allied Transportation Council, an offshoot of the Supreme War Council, drew up a reasoned list of targets susceptible to attack from the air. After the battle of the Matz, when the IX Brigade had rejoined the British armies, Major-General J. M. Salmond decided to make a series of experiments with five squadrons of day and three squadrons of night bombers. They were to attack junctions at Valenciennes, Tournai, Courtrai, and near Lille. In eight days the day bomber squadrons dropped nineteen tons and the night forty-two tons on railways. A detailed examination of the photographs shewing the results led at once to the conclusion that, unless the bomb fell accurately on the railway line, little or no damage was caused. It was useless, therefore, to attack lengths of railway.

From the beginning of their offensive the enemy had been quick to realize the importance, if not of destroying, at least of interfering with the British lines of communication. As the German advance continued these were shortened, but became more and more congested. Railway bridges would be the most profitable target if they could be hit, and the German Air Force did their utmost to do so. On the night 19th-20th May fifteen bombers sought to blow up the bridge at Etaples over the Canche estuary. They missed the bridge, but killed 182 patients in a neighbouring military hospital, and wounded 643. On the last night of the month they attacked again with better success and destroyed a span of the bridge. Since, however, we had already laid an alternative line, the interruption of traffic was of very short duration. If the loss of life in the hospital camp at Etaples was deplorable, even more so was the criminal lack of care on the part of those who had established it so close to an important

BOMBING OF BRITISH DUMPS

military objective. The crew of a German bomber taken prisoner after the first attack maintained that they were ignorant of the hospital's whereabouts and expressed astonishment that it should have been built so near the bridge. There is no reason to doubt either their word or their surprise. Such action on the part of the authorities responsible is more akin to manslaughter than to folly.

The Germans scored far greater successes against our dumps than they did against our railways. On the same night that the Etaples bridge was first attacked, some five hundred bombs were dropped on No. 12 Ordnance Depot at Blarges. As it was full of ammunition the results were disastrous. Out of 27,000 tons, 6,000 were destroyed. One shed containing trench-mortar bombs received a direct hit and disappeared, leaving a crater fifty yards wide and ten deep. On the next day it was the turn of No. 20 Ordnance Depot at Seigneville. There, too, great damage was caused, 5,600 tons of ammunition being destroyed, including 69,000,000 rounds of small-arms ammunition. Despite elaborate defensive arrangements consisting of guns, searchlights, and the Sopwith Camels of No. 151 Squadron, the Germans later on scored another success when, on the 11th August, in an attack on Calais, they virtually wiped out No. 2 Mechanical Transport Depot. Here were destroyed spare parts for 6,497 cars, 12,270 lorries, and 799 tractors, amounting to 55, 40 and 93 per cent respectively of all the stocks for these machines in France. About 26,000 inner tubes and 16,000 tyres were also burnt. A loss on this scale, though it could be made good and was, was serious for the armies on the Western Front, and critical for those in other theatres, whose commanders had long been clamouring for these vital stores, and who had still to call for them in vain. The fact was, as with the hospitals so with the dumps, the authorities would not, or could not, take the menace of bombing seriously. In their eyes the convenience of having all the wounded, all the shells, and all the spare parts together outweighed the, to them, vague possibility of their destruction from the air. Most of the authorities lived but did not learn. Most of the wounded learned but did not live.

The Germans attempted one more great infantry attack before the pendulum swung in the other direction. Prince Rupprecht of Bavaria made a last desperate attempt to capture Paris by way of Château Thierry. At midnight on the 14th July the citizens of the French capital were awakened by the roar of the preliminary bombardment. For three days the battle raged with great fury, but once more, as in the battle of the Matz, Foch was ready. The French armies were reinforced with British divisions and R.A.F. squadrons, nine of which flew southwards through rain-storms a

A GREAT ATTACK IS PLANNED

few hours before the opening of the battle. Their main task was to attack the numerous foot-bridges thrown across the Marne by the enemy, and in this they scored considerable success. Moreover, at long last we had strength enough to fight back. On the 18th July General Mangin launched a counter-attack which was so successful that in three days the Germans were back at their starting-point. The initiative had at length passed to the Allies.

To distract the enemy, a limited attack with Hamel as its object had been launched ten days before the final German offensive. It is of interest in the history of the R.A.F. because it was on this occasion that aircraft first dropped supplies of ammunition to the troops engaged, who displayed the letters 'N' and 'V' to indicate their presence and their wants. During that day ninety-three boxes of ammunition were dropped for the loss of two R.E.8s. This attack was but an interlude designed, from the point of view of the Royal Air Force, to test new methods and bring new pilots into action.

Though on the face of it the German armies in the field and the German Air Force in the air had scored a number of prodigious successes throughout the spring and summer of 1918, it is nevertheless possible to detect in the records of that time a spirit of optimism in the hearts of the Allies, as unmistakable as it is indefinable. Nowhere is this more apparent than in the squadron histories of the Royal Air Force. The hard fighting of the previous six months, with its tale of heavy casualties unflinchingly accepted, was, it was felt, about to receive its reward, and as early as the 27th July secret instructions were issued dealing with the forthcoming attack which Foch and Haig were planning. It was to be launched in the area of the Somme, but to deceive the enemy the tactics used on a small scale in the battle of Cambrai were to be repeated, and great aerial activity was to be manifested in Flanders. When the attack began, it would be the duty of the R.A.F. to appear over the enemy's aerodromes with all available bomber squadrons, to prevent any hostile activity in the air on the front of the Fourth Army, detailed for the assault, and to bomb railway stations, particularly those at Péronne and Chaumes. To carry out these tasks, it disposed of some eight hundred aircraft. The French Air Force was also to lend a hand and was able to produce no less than 1,104 aircraft to operate on the front of the First French Army, which was to advance with the British. Against this formidable strength in the air the Germans were able to muster no more than 365 machines, of which 140 were fighters. In the afternoon of the day before the battle every pilot of the R.A.F. was taken into the confidence of those who were to direct it, and received a memorandum explaining the object of the forthcoming attack and the manner in which it would be conducted.

8 Aug. 1918

FROM ALBERT TO HANGARD

The General Staffs of both the British and French armies had advanced very far from the attitude of polite or exasperated scepticism with which they had greeted the efforts of the air arm in 1914.

The attack began soon after 4.30 a.m. on the 8th August, when tanks, armoured cars, and lorries moved forward together with the infantry on a front running from Albert in the north to Hangard in the south. For once the mist, which in 1918 seemed ever to enshroud the opening stages of a battle, was this time in our favour. It was not until 9 a.m. that the R.A.F. was able to appear over the troops engaged and by then they found the German lines already in confusion and many tempting targets displayed for their bombs and guns. The air was full of machines, low-flying aircraft being especially to the fore.

Of the many actions fought that day, only a few can be mentioned. There was the bombing of the crew serving an 11-inch long-range German railway gun long used for the bombardment of Amiens. They were wiped out and part of the train to which the gun was attached set on fire. Arriving at the most opportune moment, some Australian engineers uncoupled the gun from the remaining portion of the train, raised steam in the engine and brought it triumphantly back to the British lines. There was the escape of a pilot of No. 24 Squadron, who, after bombing German infantry and silencing an anti-tank gun, was forced down by a bullet in the main petrol tank of his S.E.5A. He kept the Germans at bay with his revolver while switching to the auxiliary gravity tank which held enough petrol to take him to the British lines. There was the adventurous day spent by a pilot of No. 209 Squadron who was shot down close to a troop of British cavalry. Abandoning his useless machine, he took a carbine and continued the fight on foot.

In the first thirty-six hours of the battle the R.A.F. fighters alone dropped 1,563 25-lb. bombs and fired 122,150 rounds of ammunition against ground troops, while other machines laid smoke-screens which proved of good effect; and still others, Leigh-Mallory's No. 8 Squadron, co-operated with the tanks. Leigh-Mallory had made many experiments with wireless telephony, of which the object was to enable the crew of the aircraft to talk with that of the tank, but they had not reached the practical stage when the attack began. The more primitive method of disc signals was used with some success, and the battle proved the necessity of such a squadron. On the 10th August, one of its pilots, Captain F. M. F. West, won the Victoria Cross. While co-operating with the tanks near Roye he fought a duel with an enemy fighter in which the thigh-bone of his left leg was broken and the femoral artery severed. The leg, he reported, 'flopped

THE SOMME BRIDGES

round' the control lever, and he had to pick it up with his hands and push it out of the way before he could recover the mastery of his machine and land safely with his observer, who was also wounded.

In the afternoon of the 8th August, Salmond and the other air commanders were faced with a difficult decision. By then the enemy was retreating in no little confusion and reports shewed that his troops were converging on various bridges spanning the Somme. If these could be cut, the German army involved would be facing disaster. Air attacks upon them would assuredly be costly. Nevertheless it was decided that the prize was high enough to justify such a form of attack, even though it would exhaust a great part of our bomber strength. Repeated and most determined efforts were therefore made to destroy the bridges from the air. Two hundred and five sorties were flown and twelve tons of bombs dropped, but not a single bridge was hit and the bombers met with considerable interference on the part of von Richthofen's Circus, now under the command of the subsequently infamous Hermann Goering. These picked German fighters fought with great gallantry, but being outnumbered their task was heavy. Only by reducing to a minimum the time occupied in refuelling and rearming could they take the air frequently enough to prevent the R.A.F. from obtaining absolute mastery. 'With a real contempt for death,' says the biographer of Goering, 'the squadron . . . suffered terrible losses owing to its reckless behaviour.' The 8th August was the 'black day', not only for the German Army, but also for the German Air Force. In a few days the squadron's numbers were reduced from fifty to eleven machines.

It is possible in this last gesture of the dying Circus to detect one of the fundamental differences separating the British pilot from the German. Throughout the war the first seldom hesitated to attack, whatever the nature and performance of the machine he was flying, while the second preferred to follow the motto, 'He who fights and runs away, lives to fight another day', except in moments of real emergency when he joined battle regardless of the consequences and suffered accordingly. One advantage our enemies possessed. The Bayerische Motoren-Werke, installed in the Fokkers, was a most powerful engine and greatly increased their already good performance. Only the Martinsyde F.4, not then operational, was superior to them.

On the first day the R.A.F. lost forty-five aircraft over the enemy lines, and a further fifty-two wrecked or damaged on landing, a wastage rate of more than 13 per cent, while the casualties among the low-flying squadrons reached 23 per cent. The attacks on the bridges were continued through the night,

ROUND-THE-CLOCK BOMBING

being carried out mostly by F.E.2Bs, Sopwith Camels, and D.H.9s. Nor did they cease on the next day when the Germans again put up heavy fighter opposition, and there were many air combats in which the advantage did not always lie with the R.A.F. It was not until the early afternoon that a hit was at last scored on one bridge at Brie by a D.H.4 of No. 205 Squadron. The bombers were almost always very closely escorted by fighters. With dusk on the 10th the attacks shewed no signs of slackening, and during the following night sixteen and a half tons of bombs were dropped by 106 machines, including the large Handley Pages of No. 207 Squadron. Despite this intense activity, the first example of 'round the clock' bombing, the attacks, it must be acknowledged, were a failure. Minor damage was caused, but at no moment was any bridge over the Somme rendered unsafe for traffic. Altogether, between the 8th and the 14th August, when the target was changed, fifty-seven tons of bombs were dropped near the bridges. Had the bombers been sent elsewhere, they might, as events turned out, have proved of much greater use. This was the only failure. The other tasks allotted to the R.A.F. were successfully performed.

By the 11th August the attack died away in face of a numerically superior defence, but the battle had cost the enemy 22,000 prisoners and 400 guns. Though in itself the fight on the 8th August was far from decisive in the field, it contrived to be so, though not immediately, in the heart of the German soldier. From that day onwards he began to lose faith in the possibility of winning the war and turned his thoughts towards the achievement of peace. His rulers too began to be of the same mind. About that time it was mooted abroad that London and Paris were to be the targets for many thousands of small incendiary bombs of a new pattern which positively threw on water. The enemy made no use of such a weapon and the restraint he showed may well have been imposed by the fear that if, as by then seemed highly probable, he did lose the war, the terms of the Allies would be even more severe had he attacked their capitals in this manner.

The attacks by the R.A.F. on enemy aerodromes were not markedly more successful than those on the bridges, for the bombers were escorted by fighters carrying 25-lb. bombs and not able, therefore, to devote themselves entirely to their true role, that of providing protection. The hard fact that both bridges and aerodromes were exceedingly difficult targets to put out of action for more than a very short time, had to be learnt. From these failures, however, it must not be concluded that the part played by the R.A.F. in the first of those offensive battles was insignificant or inadequate. It was not, and the commander of the Fourth Army did not hesitate to say that 'the damage done by bombing

squadrons both by day and night, the reports of the contact patrols, and the constant and hazardous work of the artillery machines, had a very marked influence in bringing about the unqualified success of the operations'. So wrote Sir Henry Rawlinson a few days after the battle, and subsequent events supported his verdict. The R.A.F. were at the beginning of a period of triumph which three months later was to end with the German Air Force in the dust, or more accurately, the mud.

The next stage in the victorious progress of our arms was the battle of Bapaume, designed in the first place to recover the Albert-Arras railway and then to make as large a dent as possible in the enemy's lines. By that time the experiment of co-operating from the air with tanks, first tried in the battle of Cambrai, had proved its worth. No. 73 Sopwith Camel Squadron together with No. 8 were attached to the Tank Corps with orders to deal with anti-tank defences. Surprise was again of the highest importance. It was to be achieved as at Cambrai by concealing from the eyes and ears of the enemy the presence of the assaulting tanks until the last possible moment. To do this, aircraft flew over the German front line throughout the night of the 20th-21st August to drown the noise of these machines as they lumbered into position. The usual mist once more interfered with flying, but, in general, surprise was achieved and by the evening the armies had advanced between two and three miles. Though the squadrons detailed to cope with anti-tank guns were not able to go into action as soon as had been hoped, yet they achieved considerable success. 'The value of the experience gained on this day,' wrote Brevet-Colonel J. F. C. Fuller, 'was amply demonstrated by the effective work carried out . . . on the 23rd when many hostile guns were attacked and their crews scattered.' On the 22nd August Albert was recaptured and the whole line considerably advanced.

The first objective of the battle had now been attained. Its principal phase opened on the morning of the 23rd August on a thirty-three-mile front from Lihons to Mercatel. By now Haig was in a confident mood. 'The methods,' he said in an order issued to his subordinate commanders, 'which we have followed hitherto in our battles with limited objectives when the enemy was strong are no longer suited to his present conditions. The enemy has not the means to deliver counter-attacks. . . . To turn the present situation to account the most resolute offensive action is everywhere desirable. Risks, which a month ago would have been criminal to incur, ought now to be incurred as a duty.' No one was more eager to press the attack with the utmost vigour than the pilots of the Royal Air Force.

To provide them with constant and accurate information of the whereabouts of targets suitable for low-flying attacks, a wireless

THIEPVAL RIDGE CAPTURED

central information bureau was set up near Villers-Bretonneux. Its duty was to tell the pilots in the air where to find hostile machines or ground targets, especially anti-tank guns. Before the opening of the attack their position had been located by a careful study of maps and photographs. A kind of chart was then drawn up shewing where all likely enemy gun positions were situated. Early in September the success of this method was greatly increased by the capture of an enemy document in which were set out in detail all the German anti-tank defences.

Throughout the 23rd and 24th August the battle raged, the R.A.F. making many attacks on ground targets. By the evening of the second day the whole of the Thiépval ridge had been captured, and still the British advance could not be stayed. Bombing operations in the moonlight of the night 24th-25th August were more successful than usual. One pilot, discovering horse and motor transport near Metz-en-Couture, fired Very lights at the target and, as long as they illumined the scene, flew up and down over the column, bombing it pitilessly. The Germans retaliated with some success on the port of Boulogne and the aerodrome of Bertangles.

While the fighter and bomber squadrons were thus heavily engaged, the Corps squadrons were far from idle. It was their task, as always since the war began, to find suitable targets for the guns. An account of what happened to a pilot and an observer in one afternoon will show the nature and variety of their labours. Captain D. H. M. Carbery and Lieutenant J. B. V. Clements, flying an R.E.8 from 2.50 until 6 p.m., scored a first success by reporting the position of an enemy battery which was immediately knocked out. Twenty minutes later they machine-gunned a German gun moving along a road towards Bapaume; half an hour after that they spotted another German battery, which was silenced; and five minutes later some fifty German infantry were shelled as the result of their wireless call. They then shot up troops standing in the square at Bapaume, and finally brought the British artillery once more to bear on a German gun which had come into action near that town. Such exploits were the rule, not the exception, and reports of similar feats of arms performed on that and subsequent days are numerous. They were not carried out without opposition. Though inferior in numbers, the best German Fokker fighters were superior in climb and speed. On the evening of the 26th some of them fell in with No. 17 American Squadron flying Camels and scored a six-to-one victory.

The battle of the Scarpe fought by the British First Army began on the 26th August and was equally successful. Here again the R.A.F. co-operated, mostly with the Canadian Corps which led the attack and by noon on the 2nd September had burst through

THE HINDENBURG LINE

the defences of the Drocourt-Quéant switch line, an offshoot of the main Hindenburg defence line. In this success they had been greatly helped by the R.A.F. which made large numbers of low bombing attacks despite considerable casualties. Not only was their offensive action with bomb and machine-gun of great effect, but the reports which they brought back were of the utmost value. On the day on which the Drocourt-Quéant line was pierced, for example, the movements of several infantry divisions, on the flank, notably the 57th and 63rd (Naval), were dependent on the progress achieved by the Canadians. Their advance was followed with great care by two R.E.8s of No. 13 Squadron, whose pilots and observers furnished reports which 'were concise, accurate, and clear'. Relying entirely upon these, the commander of the two divisions committed them to action with instantaneous and complete success. This was but one of the many services the R.A.F. was able to render to the armies on the ground throughout the battle.

As the advance progressed and victory, complete and overwhelming, became first possible, then probable, then a certainty, these services increased. Eighty per cent of the artillery targets were very soon being provided by the R.A.F.; infantry received very large quantities of ammunition dropped to them by parachute; generals were kept constantly informed of the whereabouts of their troops; and the maps, drawn or marked by observers holding them upon their knees in bumping, bucketing cockpits, were found to be of singular accuracy.

By the 24th September the last and greatest of the enemy's defences, the Hindenburg line, was under direct threat. It was the last hope of the enemy. Everywhere else the fronts manned by their own troops or those of their allies were disintegrating. But here in the West was 'the granite wall', a conventional and inaccurate description of a defence system composed of innumerable concrete pill-boxes, carefully sited trenches, and a vast stretch of barbed wire. Foch decided to attack it in four places, and allotted to the British that part of it running from St. Quentin to Cambrai with Maubeuge as the final objective. The St. Quentin canal had been incorporated as an important and integral part of the defences. It was everywhere a formidable obstacle, but here one stretch of 6,000 yards ran beneath the ground and thus provided admirable cover close up near the front line for several thousand men.

The assault was to be made by the Fourth, Third, and First British Armies, which had the immediate support of 1,058 aircraft made up of twenty-seven fighter, four fighter-reconnaissance, seven day bomber, six night bomber, and thirteen Corps squadrons. This formidable force had been well trained and its equipment, if not perfect, was very much superior to that with which it had

'THE R.A.F. WAS EVERYWHERE'

had to go into battle in the spring of 1917. By now a method had been devised of coping with the large patrols composed of from twenty to forty machines, a formation which had now become the rule of the enemy and to which he had pinned all his hopes. To engage them not less than two R.A.F. fighting squadrons operated together, an S.E.5 or Dolphin higher up in the sky, a Camel squadron lower down. The Camels were to attack first and, when they had engaged the enemy, the S.E.s or Dolphins were to dive upon him and complete his discomfiture.

The staff work for this, the last and greatest battle, had been most carefully performed, and the orders issued to the land and air forces were very elaborate. Each type of aircraft was to be fully employed on the special tasks for which it had been designed. Thus, low-flying fighters were to pay attention to the places where the Canal was to be crossed. They were also to make sure that no enemy balloon could maintain itself in the air. Other fighter squadrons were to carry out offensive patrols to protect at once the low-flying aircraft and the day bombers whose objectives were, as usual, railway junctions and aerodromes. Finally, the Corps squadrons were to provide the maximum number of targets possible for the guns. So at long last the lessons, often bitter, learnt through four years of unremitting war, were to bear full and ripe fruit.

At 5.30 on the morning of the 27th September the assault began and before nightfall success had everywhere crowned our arms. The Canal du Nord had been crossed in many places, while the capture of 10,000 prisoners and 200 guns attested the weight of the blow which the enemy had received. On the next day villages of sinister, glorious memory, Gouzeaucourt, Marcoing, Fontaine-Notre-Dame and many others, where men had fought with desperate resolution nine months before, fell into our hands. The Royal Air Force was everywhere, and this time so carefully had the system of signalling to the artillery been devised and rehearsed, that, despite the swift movement of the battle, its Corps squadrons were enabled to direct the guns again and again on to suitable targets. To describe in detail every call for fire and its effect would fill many pages; one such, typical of many, shall suffice. On the evening of the 27th a pilot of No. 13 Squadron caught sight of German infantry massing near Anneux to deliver a counter-attack. An S O S wireless call was sent, flares were dropped, and a smoke bomb. The Germans, of whom the most part were by then assembled, were annihilated. Other less usual episodes marked that day of victory, as, for example, the surrender to another pilot of the same squadron of some thirty Germans crouching close together in a trench, who waved white handkerchiefs when he was about to open fire. Turning his machine, he

flew to the nearest British troops a few hundred yards away. They were B Company of the Hawke Battalion of the 63rd (Naval) Division. Flying very low above their heads, the pilot sought by signs to indicate that a body of the enemy just ahead of them were eager to give in. They understood the message of his waving arms and in a few minutes the Germans were prisoners.

On the First Army front the low-flying aircraft were under the command of Major B. E. Smythies. That day they dropped 700 25-lb. bombs and fired 26,000 rounds of ammunition, achieving both a physical and a moral result on the hard-pressed German infantry. Nor were the day bombers of the IX Brigade idle. Despite heavy fighting above their targets they bombed the three main German airfields with excellent effect.

Two incidents which occurred on the 28th must be mentioned. Captain G. B. Bailey and Lieutenant J. W. G. Clark of No. 13 Squadron, flying ahead of the 57th Division, perceived that the enemy had withdrawn well to the east of the Canal. They dropped a message to this effect on divisional headquarters and soon had the satisfaction of seeing the infantry quicken their advance all along the line. That day, too, Captain Carbery and Lieutenant Clements further distinguished themselves by killing or wounding the horses and crew of a German gun seeking to escape. It was shortly afterwards captured by the infantry and subsequently presented to the R.A.F. as a souvenir.

On Sunday the 29th September the assault on the main Hindenburg defences between Bellenglise and Vendhuille was launched. Captured German documents had enabled the British commanders to know the exact position of every German machine-gun, trench mortar, and battery, not to mention the whereabouts of ammunition and supply dumps, telegraph and telephone centres, signal stations, and other key-points, and, most important of all, the exact manner in which the defence of the tunnel, already mentioned, was conducted. The fighting was severe, the greatest progress being made by the 27th American Division which, pushing on too far ahead in the fog and smoke of the battle-field, found itself cut off and suffered heavily. That the day was not wholly successful was due in no small degree to the poor weather, which curtailed air operations. Mist made it impossible for pilots on contact patrol to see the ground flares, the lighting of which, to mark their positions, had long been a fundamental part of infantry training. The next day the advance was still pressed, and after stubborn resistance prolonged once again by the inability of the R.A.F. to give full support in misty, rainy weather, the whole Canal was captured and almost all the much-vaunted Hindenburg defences overcome.

Meanwhile, to the north, the British Second Army under

THE TEMPO QUICKENS

Plumer and the Belgians under their King were on the march. Their assault, delivered on the 28th September, was an immediate success and before nightfall the enemy had been cleared out of Houthulst forest. It was in this attack that accurate reports were sent down from the air by Nos. 7, 10, and 53 Squadrons by means of wireless telephone, a notable feat. For the next few days bad weather on this part of the front prevented the R.A.F. from developing its full offensive strength. Nevertheless our bombers worked hard day and night, some of the crews making three journeys. They also dropped thirteen tons of rations to the forward troops who were outrunning their supplies.

Now, indeed, the tempo of the war began to accelerate. By the 1st October the Allies had captured, in round figures, 4,000 guns, 25,000 machine-guns, and more than 250,000 prisoners. By the 8th of the month all that was left of the Hindenburg defence system was in their hands, the commanders receiving full reports from the air throughout the battle and the R.A.F. protecting the forward troops with smoke-screens generated from phosphorus bombs. No sooner did the battle die down momentarily in the south than it flared up again elsewhere. In Flanders an attack delivered on the 14th October from Dixmude to Comines on the River Lys overwhelmed all opposition. Soon Lille was threatened and on the 18th it fell. In these actions the bombers of the R.A.F. and No. 7 American (Naval) Squadron were especially active, dropping more than two thousand bombs. The enemy was at last on the run from a country which he had kept in tortured subjection for four long years. Thielt, Deynze, Lichtervelde, Courtrai, Melle, Audenarde, Ghent, and many other places, all railway junctions of importance, became congested with his transport and felt the weight of our bombs both by day and by night. On 17th October a pilot of No. 210 Squadron landed his Sopwith Camel in the market-place of Ostend and his gesture was proof that freedom for Belgium was on the wing. In the south yet another blow soon fell; the River Selle was crossed on the 17th October, and despite determined resistance the Third and Fourth Armies advanced six miles in two days.

Fighting in the air, which for some two months had been violent but spasmodic, became still more so as the inevitable end drew near. The German Air Force, though much exhausted, could still take up a challenge here and there and concentrated its whole effort upon our day bombers, bringing against them as many as fifty fighters at one time. Since the R.A.F. still had no better machine than the D.H.9 and D.H.9A, its resolute opponents, fighting with despair in their hearts, were able to score more than one success. The fiercest engagement of many took place on the 30th October, when sixty-seven German fighters were

CEASE FIRE

fulfil in a new way the age-old duties and responsibilities of the Armed Forces of the Crown. To reach this stage had not been easy, for many obstacles, material and psychological, had stood in the way. The claims and prejudices of the two older services had had to be considered and, when necessary, overcome. Admirals and Generals did not always take kindly to the air services. They distrusted, not the courage of their officers and men, but their ability to perform the tasks assigned to them. The spirit, they felt, might be willing but the flesh, as typified by the machines used, might be weak. They were wrong. Though at more than one period during the war the enemy obtained technical superiority, he never succeeded in dominating the battle-fields for a space of time long enough to ensure victory. Always was the R.F.C., the R.N.A.S., or in the later stages the R.A.F. in the air, on occasion, it is true, flying machines of inferior performance, but with pilots ever ready and resolute to carry on the British tradition of 'do or die'. Against such as these nothing could prevail—not von Richthofen and his Circus, nor the loud-mouthed anti-aircraft guns, nor all the might of Germany. The courage of the airmen was soon recognized, but their skill in fighting, in photography, in reconnaissance was not immediately proclaimed. Some time had to elapse before their supremacy in these domains was acknowledged. Nevertheless, as the months and years went by and more and more information concerning the whereabouts and intentions of the enemy flowed from the sky to the headquarters of an Army Corps or the cabin of an Admiral at sea with his ships, so did those in authority on land and sea acclaim the men of the air. In 1914 their critics were prepared to dub them ridiculous, in 1918 sublime.

18. The Clipping of the Wings

IT lacked but an hour to noon on the 11th November 1918 when the roar of many thousands of guns firing the last round in the Four Years War, shook the sodden fields of France and Flanders. Then at length there was silence. Behind the guns ranged on some ten-score airfields, were ninety-five squadrons and seven flights of the Royal Air Force, battle-scarred but unwearied, the winged might of a country and an empire which had won a resounding victory over a remorseless but by no means invincible foe. Farther afield in countries bordering the Mediterranean, in Mesopotamia, and in distant India, thirty-four more with eight flights were resting from battle, while at home fifty-five operational and one hundred and ninety-nine training squadrons completed the formidable array. A bare sixty days elapsed before it began to dwindle, and by the 2nd April 1919 there were but forty-four squadrons in France, Belgium, and the Rhineland, by the 1st August twenty-four, and on the 31st October only one. On the 3rd January 1920 it was announced that 26,087 officers, 21,259 cadets, and 227,229 other ranks had been demobilized. On the 8th March the total number of all ranks serving was only 29,730.

As with men, so with machines. The process of demobilization was equally swift, and was put as far as was practicable on a commercial basis. The Aircraft Disposal Company Limited, which came in for a certain amount of criticism, was formed and by the end of March 1920 had disposed of £5,700,000 worth of material. This included 10,000 machines, 30,000 engines, 1,000 tons of ball bearings, 350,000 sparking-plugs, and 100,000 magnetos. Much of it was scrap metal, for the orders were that everything was to be broken up, including even engines. Sykes, who had been made Controller-General of Civil Aviation in February, might well have found a use for much of the splendid material now being disposed of to any who would buy. Not everything was destroyed; more than one purchaser on the lookout for a serviceable engine would pay £5 to the Company and '£5 to the chap in charge of the scrap-heap for missing it with the hammer'.

Less than a year and a half after the end of the Four Years War the Royal Air Force had been reduced to eighteen squadrons abroad, of which eight were in India and seven in the Middle East, and two squadrons at home. Plans existed, on paper only, for a small number of additional squadrons to be attached to the Navy and to the Army. As a fighting force, therefore, it was now

‘AN EXTRAVAGANT LUXURY’

almost non-existent—but then there was no fighting. Except along the shifting Polish-Russian border, an uncertain tranquillity had descended upon nations striving wholeheartedly, if with some difficulty, to make the adjustment between war and peace. Money was needed for houses and roads, for transport and trade—in a word, for reconstruction. There was little for the armed forces. They had done their work; Germany and her satellites were in the dust. Peace had been made once again in the long hall at Versailles, whose mirrors, set in gilded bronze, had reflected the Sun King in his glory, Bismarck in his Junker pride of ugliness, and—a marked decline in the social scale—the unromantic figures of Herren Müller and Bell in their ill-fitting frock-coats, come to give formal recognition to their country's defeat. A League of Nations, from which three of the world's most powerful countries stood aloof or were excluded, was at the beginning of a tremendous task. Its permanent Secretariat was soon to be housed among the provincial delights and silver-pointed beauty of Geneva, where a world, which for more than four years had been ‘frequent in combustions, full of massacres’, could apply at any time for the flattering unction of the Covenant. The dawn was bright; but few discerned the prospect of cloud at midday, and none the certainty of storm and tempest at dusk.

Looking back on those hopeful, hurrying years of the early twenties it is easy to blame first Lloyd George, then Bonar Law, then Stanley Baldwin, for their failure to maintain, especially in the air, a force adequate to deter any country from once more renewing the challenge. Easy, but unjust. If at the beginning of the twenty-one years' peace there were many ‘who thought that now the war was over the Royal Air Force was just an extravagant luxury which might easily be dispensed with’, the fault lay in the last resort with the people of England themselves. Heavily to reduce the armed forces of the Crown at the conclusion of a successful war has long been a habit with them, and Haig's old soldiers selling matches or singing ‘There's a long long trail a-winding’ in the streets of London, were but the latest victims of a fate which had befallen in turn the veterans of King William, of Marlborough, and of Wellington. The fact of the matter was that any administration which, prior to 1933, had advocated or sought to put into practice a policy of rearmament, except on the most modest scale, would have committed political suicide. It was some years before the lone voice of Churchill was heard in the Commons uttering warnings as unheeded as those of Cassandra. It was listened to first with indifference, then with exasperation, but never with satisfaction. Members, aided and abetted by their constituents, continued to wander for years in a wilderness of good resolutions, pursuing that phantom, World Disarmament,

which finally vanished in a cloud of verbiage and bad resolutions at the Geneva Conference of 1932. That all was not lost, that when the second time of testing came, though reduced far below the margin of safety, we were not impotent in the air, is due in large measure to Trenchard.

In February 1919 he had been reappointed Chief of the Air Staff and throughout that year laboured to provide Churchill, then combining the offices of Secretary of State for War and for Air, with a scheme for the permanent reorganization of the Royal Air Force. It was set out in a brief memorandum dated the 27th November and its adoption by the Cabinet and by Parliament ensured that the foundations, at any rate, would be sound and secure whatever subsequent administrations might decide to erect upon them. Trenchard saw clearly that the problem was to reduce to a state of permanence something which had been created in a time of great emergency to play a major part in overcoming that emergency. 'The force', he said, 'may in fact be compared to the prophet Jonah's gourd. The necessities of war created it in a night, but the economies of peace have to a large extent caused it to wither in a day.' What was needed was 'a plant of deeper root. As in nature, however, decay fosters growth and the new plant has a fruitful soil from which to spring.' It had indeed. There were great numbers of young men eager to fly and to do so as members of the third and youngest of the Services. Such a Service must, if it were to take an adequate share of the country's defence, be independent. Only a force possessing this essential characteristic could hope to acquire and maintain the requisite high standard of training vital for efficiency in the field, and at the same time be capable of expansion 'without any drastic alteration should necessity arise in years to come'. This Trenchard saw very clearly and the principle he recommended, therefore, was 'to reduce the Service squadrons to the minimum considered essential for our garrisons overseas, with a very small number in the United Kingdom as a reserve, and to concentrate the whole of the remainder of our resources on perfecting the training of officers and men'. In other words, what he proposed was the creation of a small but highly technical force, kept alive and vigorous by a continuous, if small, flow of men highly proficient in the various branches of the complicated business of air warfare. Four experimental stations were to be established for aeroplanes, seaplanes, torpedo aircraft, and wireless. For the training of the officers and men, a cadet college at Cranwell and apprentice Wings at Halton were to be set up, together with a Staff College at Andover. The training of officers was itself a matter of some difficulty. The great reduction in size of the Royal Air Force meant that the number of high posts was small and the necessity

CADRES FOR THE R.A.F.

for a comparatively large number of junior officers correspondingly great. A system, therefore, of Short Service Commissions was to be introduced to cover half the total number of entries into the Service. These were to be granted for a period of some four to five years on the active list, followed by four on the reserve. At the end of the active period, officers would return to civil life with a gratuity. Regular officers would attend the College at Cranwell for two years, and after a further short technical course were to be posted to the squadrons. After five years' service they would be required to specialize in some technical subject.

Such was the plan, and it took the place of a more ambitious programme suggested by Sykes who, under Weir, had been Chief of the Air Staff up to February 1919. Sykes was strongly in favour of the creation of an Imperial Air Force to which all members of the Empire should contribute. It was, he said, no longer possible to rely upon sea power alone 'to protect our descendants either at home or in any part of the Empire'. The speed of the aeroplane was a vital factor in Imperial strategy, and for him the establishment of permanent strategic air bases throughout the Empire, together with an Imperial striking force maintained on a permanent war footing, were necessities. The R.A.F. was to be used as a bond of union to promote 'perfect and efficient co-operation between the components of the British Empire'. His memorandum urging these considerations and providing for a force of sixty-two Service and ninety-two cadre squadrons, of which thirty-seven should be forthcoming from Canada, Australia, South Africa, and New Zealand, was put forward a year before that drawn up by Trenchard. To meet the requirements of the Navy, Sykes proposed that the flying-boat should be developed so as to carry out the duties of reconnaissance, patrol, and protection of mine-sweepers, hitherto performed by ships. In the Atlantic, bases should be set up in the Azores, Newfoundland, and the Gulf of St. Lawrence, in the Mediterranean at Malta, and in the Pacific at Singapore, Hong Kong, and North Borneo. As far as the Army was concerned, fifty-seven squadrons were to be maintained in cadre. Provision was also to be made for the standardization of machines and training. To control this organization the Air Staff should be transformed into an Imperial Air Staff charged with the air defence of the whole Empire.

Sykes calculated that his scheme would cost £21,000,000 a year. It was on this figure that it was wrecked. Faced with the multitudinous problems of peace, with an electorate that believed, or affected to believe, that the new international machinery, as provided by the Covenant of the League, was a sufficient guarantee against the outbreak of future wars, the Government inclined strongly to a less ambitious programme, and at this juncture, on

14th January 1919, Weir left the Air Ministry, handing over to Churchill, who was already Secretary of State for War. It was then that Trenchard was called in. With great skill he sought to preserve vital essentials while giving way on every possible detail on which expense could be spared. In the light of what happened in 1939 it is possible to maintain that Sykes was right and Trenchard wrong, but it must be repeated that at the time the decision was taken the ordinary man in the street was too war-weary, too concerned with finding work for himself and reasonable living conditions for his family, to take expensive precautions to ensure his country and his Empire against the failure of the League. At that time no politician, not Churchill himself, was prepared to hint that the future might not always be so rosy as the present. The Cabinet moved, not against, but with the flowing tide. So far as the Air Force was concerned it preferred the minimum to the maximum, and Trenchard's proposals were the minimum.

When the Air Estimates were introduced in March 1920 the number of R.A.F. squadrons was thirty-three, eight of which were still in process of formation. The country had been divided into two areas, an Inland and a Coastal, the first being subdivided into two Commands, Southern and Northern. In the Coastal Area were included all units working with the Navy and naval airships. The total strength of the force was, in round numbers, 3,280 officers and 25,000 other ranks. At this time Trenchard was displaying great energy at the Air Ministry. True to his watchword, independence, he was never tired of preaching that the R.A.F. must be a separate force, at least in so far as its main strength was concerned. 'I cannot have the Air Force broken up', he said one day to Lord Londonderry, presently to be an energetic and maligned Secretary of State for Air, 'so that the pilots are simply just conveniences for reconnaissances for the Fleet.' Yet he was strongly in favour of special air branches to co-operate with the Navy and the Army.

Long before he became Chief of the Air Staff for the second time, Trenchard had become a personality—perhaps the strongest personality in the Royal Air Force. To his duties he brought courage, shrewdness, and vision, and he continued to display that singleness of purpose and aim for which he was already renowned. He was the head of a new Service, which, having proved its worth in war, had to justify its existence in peace—a far harder task. From 1919 to 1929 Trenchard laboured without rest or respite and his great voice booming down the corridors of the Air Ministry gave an affectionate nickname to a very great man, while his habit of pressing all the bell-pushes on his desk simultaneously, when he had anything of importance to discuss, kept them ever on the

‘A KIND OF FIRE BRIGADE’

alert. His eye was as quick to mark detail as it was to make a broad sweep, surveying with keen, appraising glance the difficult post-war landscape. He could decide a matter of principle one moment and the next be discovered telephoning to each of his squadron commanders in turn to know the exact quantity of immediate reserves in their possession. His staff suspected that he reached his decisions as often by intuition as by reasoning, and they were confirmed in this view by that disarming simplicity which was one of his characteristics. ‘I can’t write what I mean,’ he once said to his Personal Assistant in the early days of their association, ‘I can’t say what I mean; but I expect you to know what I mean’—and the official in question rarely had any doubt. It was this single-heartedness and simplicity which stood the Royal Air Force in such good stead during the first difficult years following the Armistice of 1918. Not until April 1923 did the number of Home Squadrons show any increase. Even then only two were added to them.

From what happened in the years immediately succeeding the Four Years War it might seem that, as some hoped, the disappearance of the Royal Air Force, or at the very least its reduction to a position of little or no influence on events, would be accomplished. It is sad but true to say that at the time there were not wanting those who would have preferred to see it a tame jackdaw with clipped wings, hopping about the rich suburban garden of a bright post-war world, rather than a jessed hawk ready, when loosed, to swoop upon any intruder who might climb the fence and seek to steal the flowers. Nor, if the elder Services may be compared to the watchdogs in the stable-yard, is this analogy as far-fetched as might at first sight appear. All three Services, the Navy, the Army, and the Air Force, are necessary for the preservation of the State. But that simple truth was far from apparent at a time when ‘peace, retrenchment, and reform’ seemed once more to be the only reliable, or indeed desirable, slogan. The necessity for a Navy and an Army was never questioned by the man in the street, provided they did not cost too much, nor was that of an Air Force. But in certain quarters there was a tendency to regard the last of the three, not as an integral part of the national defence system, but as a kind of fire brigade, or use only in an emergency and therefore, if the house could be made fireproof, an expensive luxury. It was reserved for a conference held at Cairo from the 12th to the 30th March 1921 to provide the Royal Air Force with peace-time duties of an importance at least equal to those of the sister Services.

What to do with the overseas possessions of Germany and with certain parts of the Turkish Empire had been one of the many problems confronting the framers of the Treaty of Versailles.

They had done their best to solve it by the institution of the Mandates system, and these desirable, if perilous, responsibilities had been divided between the victorious Powers. A large share had fallen to Great Britain, and part of it was the Mandate over the former Turkish territory of Irak. To preserve the boundaries of this embryo state from external aggression was the paramount duty of the Mandatory Power. How could it best be fulfilled, with least expense to the taxpayer and with the greatest measure of efficiency? Our Indian Empire had presented a similar problem for many years. The tribes along its north-west frontier had been a source of trouble and expense to successive administrations, of decorations to the Indian Army, and of inspiration to Rudyard Kipling and other writers of his school. Privates Ortheris, Learoyd, Mulvaney, and their like, had for years marched and fought and died in the dusty hills about the Khyber Pass, and generations of Gunga Dins had helped the white man to bear his burden from Baluchistan to the Hindu Kush. Now all this was to be changed and a new method of controlling the unruly warriors of the border to be adopted. Its use was presently to provoke sharp controversy, but this was still in the future when on the 12th March 1921 the conference of high officers and high military and civil administrators, presided over by Churchill, then Secretary of State for the Colonies, assembled at Cairo.

To it Trenchard and Churchill propounded a scheme for the protection of Irak, and therefore of all territories with races of uncertain temper along their boundaries, which was at once to place the young and eager Air Force on the same footing as its two elder brothers. By its provisions four single-engined two-seater squadrons, one squadron of Sopwith Snipes, one reconnaissance squadron of Bristol fighters and two squadrons of Vickers Vimy bombers, converted to act as troop-carriers, would suffice to maintain order throughout Irak. All that would be necessary on the ground would be the existing Arab army and a small force of armoured cars. British troops could be reduced in number to one brigade and a single pack-battery. The alternative was to ignore the possibilities of the air and maintain a garrison of twelve battalions of infantry, one regiment of cavalry, one pack-battery, and a contingent of engineers. Even then they would not be able to perform their duties efficiently without the help of five squadrons of aircraft. The Conference did not hesitate. Trenchard's scheme was adopted and immediate steps taken to carry it out.

Thus the Cairo Conference marks a step, and a very important step, in the development of the Royal Air Force. The decisions there taken gave to it a definite peace-time role, which it had to

KEEPING ORDER IN IRAQ

play successfully if order were to be maintained in parts of the world up till then notorious for unrest and disorder. Thanks to the possession of an independent Air Force, a separate Service closely linked to the others but capable of being used independently, the Government was in a position to fulfil part, at least, of its Imperial obligations at a minimum of cost and a maximum of efficiency. More than that, the decisions of the Cairo Conference were in the nature of a portent. They opened a long vista of possibilities and shewed the world, albeit at first dimly and in a manner hardly appreciated by the man in the street, what the possession and use of aircraft mean in terms of control and dominion.

Order in Irak and the neighbouring country of Transjordan was maintained not only by the aircraft but also by the armoured cars of the Royal Air Force. Thus a form of warfare begun by the Royal Naval Air Service in the early days of the Four Years War was revived ten years later and proved how useful a small force of trained experts, armed with modern weapons, could be in discouraging that passion for raiding their neighbours which is the main occupation of so many Bedouin tribes.

The task of the men in the armoured cars was to assist by the closest co-operation the pilots in the air. The cars, in effect, worked 'in the shadow of the aircraft'. They had to do so in country of the most difficult kind. In places they could operate in vast tracts of hard gravel at which a speed of between fifty and sixty miles an hour could be reached and maintained. Then with but little warning a patch of soft gravel would be encountered, or a steep wadi over which the cars had to be manhandled. Tyres were subjected to much wear and tear, and the maintenance at an adequate level of water in the radiators was always a problem.

In this inhospitable land, whose wide stretches of stony or sandy soil are covered in parts with coarse vegetation, are to be found a number of oases in which dwell small settled communities. These were, and still are, the victims of various nomadic tribes such as Akhwan of Nejd who are capable, on their trotting camels, of covering a distance of fifty miles in as short a time as twelve hours. Armed with rifles and trained to shoot from the saddle, they proved themselves in the late twenties and early thirties of this century to be formidable opponents. The raids were carried out for religious and economic reasons. Those who professed a less pure version of Islam than that affected by the raiders were the objects of their attention, while the fact that such less fervent adherents of Mohammed were possessed of desirable worldly goods was an added motive for attempting their punishment or conversion. While casualties were not as a rule very high, the raids

ARMoured CARS IN THE DESERT

were often bloodthirsty in the extreme. No quarter was given and the dead and wounded were barbarously mutilated.

The period during which the armoured cars of the R.A.F. were particularly active was between 1924 and 1929. The form of vehicle used carried a crew of three with sufficient fuel and water for a journey of three hundred and fifty miles. The cars manœuvred much in the same way as does a flotilla of destroyers. They were controlled by their commander, who gave his orders by means of flag signals and lights. The main tactical problem which they had to meet was that of pursuing and intercepting raiders. Since they co-operated closely with aircraft the armoured cars were not dependent for supplies on lines of communications stretching to their base. They could be and were refuelled and rearmed from the air, and at least once a Rolls-Royce car far away in the northern desert, where it had broken down, was refitted with a new gearbox by its crew working in a temperature of 110 degrees.

In many cases the victories secured were bloodless, for the raiding parties surrendered immediately on the appearance of the cars. Moreover, a number of the tribes were friendly, naturally those who were singled out as victims by the ferocious Akhwan. On one occasion, for example, the paramount chief of the Amarat tribe was conveyed to Baghdad by air after he had asked a section of armoured cars to bring him a doctor. The old sheik—he was ninety years of age—was a dying man, but he nevertheless consented to make the journey by air, and on reaching the city's hospital sent for the pilot and said: 'This is my first and, In-shallah, probably my last ride in the belly of the great bird, and I have enjoyed it and wish to thank you and the father of the motor-cars.' On the next day he died.

What the armoured cars could accomplish can be seen by the operation they carried out in March 1927 against a raiding party of Huweitat from Syria. The cars made a forced march of two hundred and twenty-five miles across the desert in eighteen hours and awaited the raiders in a wadi for which they were making. On their arrival at dawn a burst of fire into the ground on their flank induced them to surrender immediately. In 1928 the occupation of the desert well at El Hafar led to the complete discomfiture of a large force of Akhwan raiders. On this occasion it took the cars seven hours to cross a sand belt fifteen miles wide, and a hot following wind caused each Rolls-Royce radiator to consume eight gallons of water. The column pushed on until a further six gallons had evaporated, and then formed a defensive camp fifty miles from the objective. Here they remained till the fierce thunderstorms through which they had advanced had abated, when they were refuelled from the air, at once pushed on,

ON THE NORTH-WEST FRONTIER

and by their mere presence deterred the raiders from indulging in any active operation. In ways like these did the new Service maintain order in the Middle East.

Trenchard had certainly been influenced in making his recommendations by the action already taken by the Royal Air Force in India. The R.F.C., and later the R.A.F., had been established in that country since 1914, in which year a central flying school had been set up at Sitapur. Two years later the Flying Corps had carried out the first of many operations on the North-West Frontier. In the autumn of 1916 the Mohmand tribe shewed signs of wishing to indulge their propensities for raiding in the Peshawar area. 'A' flight of No. 31, and 'B' of No. 22 Squadron, flying B.E.2cs, helped in their suppression, and General Campbell, in command of the forces against them, made flattering reference to the effective work of the R.F.C. Hardly had the Mohmands been dealt with when in northern Waziristan the Mahsuds showed signs of turbulence. A lashkar was seen from the air early in March, but it was not till the end of May that punitive measures were undertaken. On the 12th a B.E.2c of 'B' flight fired five drums of ammunition into a crowd of Mahsuds and broke it up, and the following day four direct hits from bombs completed their discomfiture. Another aircraft of the same flight co-operated with the troops on the ground, sending back wireless messages which were received by a set carried on the back of a camel. After further bombing operations, of which the most notable occurred on the 26th June, when the home of the tribal chief was destroyed, the Mahsuds sued for peace and in the Jirga convened for that purpose frankly admitted that attacks from the air were much dreaded since they were powerless to contend against them.

At the beginning of 1918 there was considerable unrest in Baluchistan among the Marri and Khetran tribes who, on the 7th March, looted the local treasury at Barkhan and burnt the Government buildings. The expedition sent against them was helped by nine B.E.2cs. By the end of March the bombing of their capital at Kahan had induced a mood of submission, and by the beginning of May the frontier flare-up was over.

Thus, long before the Four Years War was at an end, the R.F.C. and its successor, the R.A.F., had proved, at least to the satisfaction of the military commanders on the spot, the overwhelming importance of the air arm in keeping the peace along the north-west borders of India. Trenchard had, therefore, ample and successful precedents to urge when proposing that the defence of Irak should be placed mainly in the hands of the Royal Air Force. It was not long before the system he proposed was tested.

At the end of 1922 a crisis arose in the Middle East. Under the energetic and remorseless leadership of Mustapha Kemal, Turkey had rapidly emerged from the depths of humiliation into which the victories of Allenby had plunged her, and by the autumn of 1921 had inflicted a heavy defeat upon the Greeks in Asia Minor. Arising phoenix-like from the burning ruins of Smyrna, a new Turkish State came into existence and by 1923 Turkey had recovered at Lausanne all and much more of the position, though not the territories, she had occupied before 1914. She was again a power which could by no means be ignored. On the other hand Mustapha Kemal had not succeeded in restoring completely to his country all that had been lost by the folly of Enver and his gang. To the south-east of Anatolia lay Syria and beyond Syria, Irak. It was in the second of these two countries that the Turks sought to make trouble. This they did by stirring up the warlike Kurdish tribes in the Vilayet of Mosul and in Kurdistan itself. By September 1922 a small Turkish post had been established within forty miles of Kirkuk. Air action against it and neighbouring villages was taken, and the Turks were driven away. The operations, carried out under the command of Sir John Salmond, were facilitated by the extensive use of Vickers Vernon aircraft to ferry supplies from Baghdad to Kirkuk. The Lausanne Treaty, however, had not dealt with the situation in the Vilayet of Mosul, claimed by the Turks as an integral part of their country, and the situation there remained confused for the better part of two years. Desultory fighting to settle its fate broke out in 1924 while with ponderous suavity the Council of the League of Nations sought to recommend a peaceful solution. It was not until December 1925 that it reached a unanimous decision, and not until June that the matter was finally settled between the British, Turkish, and Iraqi Governments by an agreement signed at Angora.

Long before this solution was achieved, the ferocious and remarkable figure of Sheik Mahmud had made the first of his fitful and disturbing appearances. Authorities differ as to the character of the Sheik. To some observers, notably Major Soane, he was a bloodthirsty tyrant; to others, among whom was Captain Holt, the Oriental Secretary to the High Commissioner in Baghdad, he had many redeeming features. Sheik Mahmud had first come into contact with the British in April 1915 when he had led his feudal levies in a gaily caparisoned and costly charge against the British forces in the battle of Shaibah. On that occasion the Sheik and his followers signally failed to drive the infidel into the sea, which they believed to be his home. Mahmud continued unsuccessfully to try, but by May 1919 his dream of a free, united Kurdish people seemed to be shattered;

A WARLIKE SHEIK

for, defeated in the field, he had fallen into our hands and been awarded first a sentence of death and then, when this was commuted, one of ten years' imprisonment. In 1922 when pressure from the Turks on the northern frontiers of Irak became considerable, Sheik Mahmud was hastily removed from his prison in India and sent to organize the tribes in that area. He had sworn to act on behalf of the British administration, but presently, breaking his oath, sought to attack Kirkuk. Delayed-action bombs, dropped outside his capital of Sulaimaniya, merely caused him to lie about his intentions. Precarious order was restored, largely by means of the R.A.F., but by the summer of 1923 Sheik Mahmud had proclaimed himself King of Kurdistan and begun to raid in every direction. Encouraged by the rebellion of a number of sheiks in southern Irak and Nejd, he threw off the mask and declared a Jihad or a Holy War against England and her perfidious allies, the Assyrians. It was evidently high time to put an end to the activities of the warlike sheik. Forty-two aircraft from Nos. 6, 8, 30, 45, 66, and 60 Squadrons were concentrated for the purpose. Mahmud was ordered to surrender and, on his refusal, Sulaimaniya received twenty-eight tons of bombs and suffered 'severe damage'. Though dwelling-houses were destroyed, no inhabitant was killed or injured, for they had received warnings from the air to abandon the town. In July 1924 what was left of it was re-occupied by our forces, but they did not remain there for any length of time. In May and June 1925 the conflict was renewed and in the end the sheik was heavily defeated and driven to take refuge in Persia. Much the same happened in 1926 when air action was particularly effective. Towards the end of the summer, Sheik Mahmud, finding that he was unable to prevail, once again retired into Persia, this time taking with him a pilot and an air-gunner of No. 30 Squadron who had landed with engine trouble inside his lines. He treated the British airmen well, and when, in the autumn, they fell ill allowed an army doctor to visit them. They were eventually released in October, and in 1927 the Sheik made his submission.

A picture of the conditions in which the Royal Air Force in Mesopotamia lived and worked during those years is painted in the memoirs of Hilton Keith. Each unit was dependent on itself for everything. Quitting at dawn buildings constructed of mud bricks, officers and men worked till noon, then slept through the heat of the day when the temperature rose not infrequently to 128 degrees in the shade. Their clothes were 'drill shorts and shirts with a spine pad, topee, and anti-actinic goggles'. The sun was deadly and 'must never be neglected. We even fly in special topees, commonly called "Baghdad bowlers".' The pilots and observers carried on them letters written in Arabic, Syrian, and

Turkish, known by the sinister sobriquet of 'blood chits', and promising a ransom of three thousand rupees to all who aided the airmen if they were forced down by engine or other trouble. 'So long as they want the money, all is well, but if they don't, they turn you over to the attention of their womenfolk whose inclinations are apt to prove embarrassing and painful.'

Flying over the Kurdistan mountains was an experience which rarely lost its fearful charm. From the Bristol fighter with its steady, pulsating Rolls-Royce Falcon engine, the pilot and observer would gaze down upon 'row after row of misty white peaks, looking like sleeping giants; dark, deep valleys, whose sides are so sheer that one wonders that even light cares to penetrate into their depths; angry little silver streams, working themselves into white fury as they twist and turn in their relentless quest for the freedom of the sea'. In such country as this did Sheik Mahmud take refuge when the Royal Air Force and the slower moving troops on the ground made his position on the plains untenable.

It was not till three years later, in 1930, by which time Irak had become an independent State, that Mahmud made a final bid to establish himself as ruler of a Kurdish State. The newly formed Iraqi army moved out against him, and in the Beluli district the R.A.F. destroyed a number of villages housing his followers. As the campaign progressed, air action became more and more deadly, until on the 13th May further resistance became impossible and all was at last over. On that day a thick-set man with a protruding lower lip crowned with a heavy moustache, rode through the dusty street of Penjwin on his way to exile. The Kurds from the hills clustered about him to kiss his hand, with tears in their eyes. Cruel and tyrannical he may at times have shewn himself, yet his tyranny was 'mellowed by the generosity of a Prince'. His ambition was for his nation rather than for himself, and the man who stepped on board a Royal Air Force machine to be flown to captivity in Ur was acknowledged by friend and foe alike to have fought a gallant fight and to have yielded to a new weapon and a new method of warfare against which he had no chance to prevail. Sheik Mahmud was born a hundred years too late. This was not a fault but a misfortune.

In other parts of the world, too, the R.A.F. had by then largely relieved the Army of its duties connected with the control of frontiers. In Somaliland it was 'the main instrument and decisive factor in the defeat of the Mullah, who for twenty years had more or less successfully defied British power'. In but twenty-one days twelve D.H.9s, in co-operation with a small contingent of the Camel Corps, sufficed utterly to overthrow him. On the other side of the Gulf, tribesmen of the Yemen were kept in

AN AERIAL BLOCKADE

order by similar methods, and in 1928 the Imam Yahya was forced to abandon his marauding habits. This prince could command the services of some six thousand trained men under Turkish ex-officers, and double that number of irregular levies. To take the field against him would cost, so the Government of India ruefully calculated, about £10,000,000. The Royal Air Force was able to accomplish the business for £8,500 and the cost of one new machine smashed in an accident. Only twelve aircraft were necessary and the bombs that they scattered caused the Imam and his followers to find that 'their barriers of desert and mountain had melted away'. Similar action was taken in 1929 against the Subehi tribes and by the 5th March, having seen from the mountains their deserted villages go up in smoke and flame, they sent a deputation to ask 'what to do to stop this calamity which has befallen'. Before March was out they had yielded to all the demands of the Resident. In 1934 what amounted to an aerial blockade was imposed on the tribe of the Quteibis, whose habit it was to rob caravans. They were prevented by bombing from occupying their villages or tilling their fields, and after two months were ready to come to terms.

In India the Air Force, which had already acquired considerable experience against the Mohmands and the Mahsuds, found itself, at the end of 1918, involved in the third Afghan war. It carried out its usual work of reconnaissance and attacked several posts of the enemy with bombs. On the 24th May 1919, Lieutenant R. Halley bombed Kabul and 'there is little doubt', runs the official dispatch, 'that this raid was an important factor in producing a desire for peace at the headquarters of the Afghan Government'. Operations took place in 1925 against the tribes in Waziristan, which were brought into subjection by the Royal Air Force at a cost of two casualties.

In 1928 and 1929 considerable unrest occurred in Afghanistan itself, culminating in a rebellion against King Amanullah, whose Western ways—his Queen, it was said, bought her dresses in Paris—had become a source of increasing irritation to his subjects. By the end of December 1928 the rebel leader Kabibullah Khan had laid siege to Kabul, and the British minister called for the evacuation of all women and children from the Legation. The Royal Air Force was quick to respond. The first contingent were removed on the 23rd December and by the 25th February 1929 586 civilians of various nationalities had been successfully taken by air to India. To do this, seven Vickers Victorias and one Handley Page flew 28,160 miles over mountains, of which the average height was above 10,000 feet. Among the refugees thus brought to safety was a chieftain, Bachi Sachar, and his harem, who, to board the rescuing aircraft, walked, veiled and fearful, across the

FLYING THE ATLANTIC

dusty airfield at Kabul which lay in no-man's-land between the rival forces. Accompanying them were a few members of the British Legation, unarmed but lending them the protection of their presence, and this sufficed.

Aerial expeditions against unruly tribes carried out at small cost to the taxpayer—the last was made against the Fakir of Ipi in 1938—were but one feature of the life of the Royal Air Force during the years of peace. They were not even the most spectacular. The press and radio reserved their fullest comments for long-distance flights and the speed contest for the Schneider Trophy. The first long-distance flight took place in June 1919 when on the night 14th–15th Captain J. Alcock and Lieutenant A. Whitten Brown, both late of the Royal Air Force, flew the Atlantic from St. John's, Newfoundland, to Clifden on the coast of Ireland in sixteen hours and twelve minutes. The machine they used was a Vickers Vimy bomber of standard service type, save that its petrol and oil capacity had been increased to 865 and 50 gallons respectively by fitting extra tanks. With this amount of fuel the aircraft had a range of 2,440 miles in calm air. The start of such a heavily loaded machine was fraught with difficulty and danger. Alcock had to take off, so he says, 'up a slight gradient with a little side wind, the narrowness of the ground preventing the start being made head to wind. The machine took off very easily, but I experienced some trouble in attaining sufficient height so I had to fly down a valley which had a very steep range of hills on either side, this causing bad bumps, and a considerable amount of height was lost through the bumps. After some difficulty we eventually reached the end of the valley and turning the machine head to wind climbed up to a thousand feet and proceeded on our course.' This was over St. John's and the Vickers Vimy was soon flying in the thick fog that clings about those coasts. For seven hours the airmen saw neither sea nor sky, till at last a clear patch enabled Brown, the navigator, to get 'a sight of the Pole Star, Vega, and the moon'. Then fog, more dense than ever, closed about them and the machine began to bump and bucket to an extent which made it hard to maintain the proper course. At one moment the aircraft began to spin, and fell the best part of four thousand feet before Alcock succeeded in regaining control only a short distance above the surface of the Atlantic. Daybreak found him and his companion climbing through the fog with hail and sleet buffeting the wings and fuselage and causing the instruments to become unserviceable. Eventually at a height of something over eleven thousand feet the navigator obtained a 'fix' on the sun. They then descended almost to sea-level again, finding clear weather at last but also a very strong south-westerly wind. After forty minutes more, flying at a height of a few feet above

MORE LONG-DISTANCE FLIGHTS

the surface of the water, they saw at last the islands of Eishal and Turbot off the Irish coast. Another ten minutes and the masts of the Clifden wireless station, thrusting through rain and mist, gave them their exact position. They circled round, firing Very lights which attracted the attention of nobody. Eventually choosing what he hoped was a suitable spot, Alcock put the Vickers Vimy bomber down in a field which 'turned out to be a bog . . . but we were unhurt'. So ended the first crossing of the Atlantic, a feat for which Alcock and Brown were knighted. They had had better fortune than Hawker and Grieve who had made the attempt a short time before and fallen into the Atlantic, from which they were rescued by a passing ship.

Later that same year Captain Ross Smith and Lieutenant K. M. Smith flew in the same type of machine from Hounslow to Port Darwin on the northern coast of Australia, taking just under a month to do so. For this feat they, too, were knighted. 'There developed in me', says Ross Smith, describing the approach to Batavia near the end of the long journey, 'a strange admiration—almost a reverence—for the super-mechanism that hummed away rhythmically, that had now covered ten thousand miles without an overhaul. . . . These were times for musing as we sped along above this tranquil tropical landscape. . . . Numbers of small islets—emeralds in a setting of turquoise—passed below us. There were yearnings to land and explore their mangrove-fringed bays. . . . The sea was a glorious mirror, and scattered broadcast lay the Thousand Isles.'

A third pair of airmen, Wing Commander H. A. Ryneveld and Flight Lieutenant C. J. Q. Brand, were also to receive the honour of knighthood for a long-distance flight which began at Brooklands in a Vickers Vimy on the 4th February 1920 and ended at Capetown in a D.H.9 on the 20th March. Their adventures were many, and two machines were destroyed in the flight, in the course of which they crossed the Mediterranean from Taranto to Derna in eleven hours, flying through unrelenting bad weather.

As the years went by the length and duration of the flights grew ever greater. Moreover, the feats performed by airmen of other nations, notably the United States of America, stimulated the spirit of rivalry and competition. In July 1931 two Americans, Russell Boardman and John Polando, beat Lindbergh's New York to Paris non-stop flight of 1928 by a flight from New York to Constantinople, a distance of just over five thousand miles. On the 6th February 1933 Squadron Leader O. R. Gayford and Flight Lieutenant E. Nicholetts set out from Cranwell in Lincolnshire to beat this record. Fifty-seven hours and twenty-five minutes later they landed at Walvis Bay in South-west Africa with but ten gallons of petrol left in the tanks, having covered

5,341 miles. Gayford and Nicholletts succeeded where Squadron Leader Jones-Williams and Flight Lieutenant N. H. Jenkins had failed at the cost of their lives. Three years earlier they had tried to perform the same feat and had run into the Atlas mountains near Tunis, with fatal results. On both these flights the machine used was a specially constructed Fairey monoplane.

Such flights as these were not merely sensational achievements designed to show off the possibilities of air transport. They were the efforts of pioneers to link our wide-flung Empire by means of the aeroplane. Such a scheme had been in the minds of the Air Council as early as February 1919 when two D.H.4s set out from Baghdad to carry the Civil Commissioner of Mesopotamia and his staff to the Peace Conference at Paris. Mechanical defects prevented the completion of the journey, but it was a beginning, and on the 18th March of that year a flight from Baghdad to Egypt was completed for the first time between dawn and sunset.

The Government concentrated in the beginning upon establishing a permanent air route between Egypt and Irak. Its completion and maintenance would mark the first stage on the airway to India and Australia. Since much of the territory between Damascus and the Euphrates was not under our influence, a more southerly route was chosen, and Dr. John Ball, Director of Desert Survey to the Egyptian Government, mapped the direction to be followed. The tracks made by cars and lorries crossing the desert to Baghdad were in many places easily visible from the air. They were supplemented by arrows marked upon the ground, and in 1922 a track made by ploughs ran right across the desert for the guidance of aircraft. These arrangements, seemingly somewhat primitive, proved entirely effective. On the 23rd June 1921 the route between Cairo and Baghdad was opened and soon an official air mail service was operating along it, provided by Nos. 30 and 47 Squadrons, and later by Nos. 216, 45, and 70. It continued until 1927, when Imperial Airways took over the task of carrying the mails.

At home, efforts were being made to persuade the taxpayer that British aircraft were a trustworthy and reliable means of joining together the various parts of the Empire. In the autumn of 1925 four flying-boats made a 2,500-mile tour round the south of England, the north of Ireland, and Scotland. In the next year other flying-boats flew round the Mediterranean, and four Fairey III Ds flew from Cairo to the Cape and back between the beginning of March and the end of December. In 1927 flying-boats visited the Baltic, and four of them, commanded by Group Captain H. M. Cave-Brown-Cave, flew to Singapore, arriving on the last day of February 1928. Thence they made a cruise round

CIVIL AVIATION

the Australian continent, and in 1929 flew to India and back. Five years later three Short Rangoon flying-boats of No. 203 Squadron flew from Basra to Melbourne and back, a journey which involved crossing India twice.

By 1924 Lord Thomson, six years later to lose his life in the disaster which befell the airship R.101, became the first Labour Party Secretary of State for Air. He was emphatic in his view of Empire air routes. Provided that adequate air bases, all established in British territory, could be created, in 'ten days and nights the traveller and the mail-bag out of England would arrive in the most distant of our Dominions'. More than that, from a strategical point of view it was vital for the air defence of the Empire to be made sure and certain by means of air routes, always and wholly in our control. 'Imperial air strategy,' he urged, 'will lack coherence while it depends on air stations which are either temporarily hostile or even neutral.' That Lord Thomson was right no one will deny, any more than will the efforts of the Air Ministry in the years after the war of 1914-18 to promote Imperial air routes be questioned.

In so far as was possible, that Ministry did what it could to help civil aviation. The problem had to be handled by the Controller-General of that branch of flying, and he was as usual hampered by lack of money. When approached on the subject, a high Treasury official, says Sykes in his memoirs, announced that 'he viewed anything to do with civil aviation with implacable hostility'. Such being the official attitude, it is scarcely surprising that it was not until December 1934 that a through London-Australia air line was opened, and not until June 1938 that there was a twice-weekly service of two-decked flying-boats. There is little doubt that, had money been forthcoming, an 'all-red route' by air round the world could have been established in the early twenties of the present century.

The Air Ministry sought to help not only by aeroplanes but also by airships, of which they had taken over the construction in 1919. Lack of funds soon caused the abandonment of the original programme under which one new rigid airship was to be laid down every two years. The R.38, however, was completed because it had been sold in advance to America, but other airships were handed over to the Controller-General of Civil Aviation for experimental purposes. In January 1921 the financial position was such that the Air Ministry was forced to disband the airship service of the Royal Air Force. An endeavour was made to sell its equipment, but without success. About this time the R.38 was undergoing her trials and on her fourth flight in August she broke in two in the air over Hull; forty-three lives, fifteen of them American, were lost. Despite the successful crossing of the

THE R.101 MEETS DISASTER

Atlantic by the R.34 between the 2nd and the 13th July 1919 this disaster to a sister-ship occurring two years later seemed to sound the knell of airship development. Nevertheless, Commander C. D. Burney, who had long been associated with this type of flying machine, did not despair and propounded a scheme which was considered by a Cabinet Committee of the Labour Government of 1924. It was decided that the expense of the full-scale experiments, necessary before any programme of construction could be entertained, must be carried out by the Government, and the R.33 was accordingly re-conditioned. She soon shewed remarkable powers of endurance, successfully riding out a severe gale on the 16th April 1925 when attached to the mooring-mast at Pulham. Experiments in the launching of aircraft from airships and their subsequent re-attachment to the parent craft were also conducted and met with some success. By 1930 the Government possessed two large airships, the R.100 and the R.101. In August of that year the first made a successful flight to Canada and back. The second, however, met with disaster. On the 4th October she rose from her mooring-mast at Cardington on a flight to Egypt and India. At 2.50 a.m. on the next morning, when the flight was but a few hours old, she got into difficulties over Allone, a village near Beauvais in northern France. A minute or two later she hit a small hill, crashed to the ground and burst into flames. Of fifty-four on board, forty-seven were killed, among them being Lord Thomson himself, Air Vice-Marshal Sir W. Sefton Brancker, who had succeeded Sykes as Director of Civil Aviation, and Major G. H. Scott, who had commanded the R.34 on her flight to America and back. As far as this country was concerned the wreckage of the R.101 was the wreckage of further belief in airships. All work upon them was abandoned and has not been revived. Henceforth the aeroplane was to reign unchallenged on such Imperial air routes as the parsimony of peace enabled us to construct.

Though, as has been said, it took many years for them to become operational, yet much quiet and unassuming work in the preparation of aerodromes was performed. Egypt—being, as Trenchard had pointed out in 1919, the Clapham Junction of the Middle East—was the main point of concentration, and here in the Canal zone airfields were built and equipped which were to prove of the utmost importance in the next war. When it came, as far as ground organization went, we were not wholly unprepared, and, though more might have been done, much had been done.

In other fields, however, in which private enterprise at times came to the rescue of the public purse, the Royal Air Force was wholly successful. The Schneider Trophy contest was instituted

THE SCHNEIDER TROPHY

in 1913 when Monsieur Jacques Schneider, the armaments manufacturer, presented the French Aero Club with a trophy to be competed for by seaplanes of any nationality over a course not less than one hundred and fifty nautical miles in length. Nineteen-twenty-seven was the first year in which the R.A.F. entered for it. The machines used were Supermarine Napier S.5 seaplanes and the place was Venice, whose still lagoons echoed for some days with the roar of what were then the most powerful internal combustion engines in the world. The other competitors were Italy and America, the first being represented by Macchi seaplanes painted a vivid scarlet, while the second did not put in an entry. The British pilots, Flight Lieutenants Kinkead, Webster, and Worsley, and the Supermarines soon showed themselves much superior to the Italian pilots and aircraft. Kinkead in his third lap touched 289.186 miles an hour before his engine gave out, and the winner, Flight Lieutenant S. N. Webster, who completed the course, flew at an average speed of 281.84. 'Undoubtedly one of the greatest factors,' records an eye-witness, 'in this high speed was the superb cornering of the British pilots. Instead of making a clean banked turn like the British, each Italian pilot went up steeply at the mark so that the machine ended up "on her back", and although this was certainly more spectacular, there was no doubt that even the steep dive afterwards did not compensate for the valuable split seconds lost.'

That such speed could be attained so soon after the Four Years War shews how quickly the aircraft engine could be, and was, developed. Yet two years later this record was far surpassed, when Flying Officer H. R. D. Waghorn in a Supermarine Rolls-Royce 'S' seaplane won the contest with an average speed of 328.63 miles an hour. On the 29th September 1931 the R.A.F. eventually won the trophy outright when Flight Lieutenant J. N. Bootham, flying a Supermarine Rolls-Royce 'S' 6 seaplane, reached a speed of 340.08 miles an hour. That the R.A.F. was able to compete in this, the last of the Schneider Trophy contests, had been due to a gift of £100,000 made by Lady Houston towards the cost of producing the aircraft. The contest had been flown near Lee-on-Solent, and a few days after it was won Flight Lieutenant G. H. Stainforth, a member of the special High Speed Flight which had been formed under the command of Squadron Leader Orlebar to fly these very special machines, broke the world's record by attaining a speed of 407.5 miles an hour.

To fly an aircraft with an engine developing about 2,600 h.p. was no mean feat. Pilots had to be specially trained and the risks were high. The machines were inevitably nose-heavy and to take-off in them except in calm weather was impossible. Once in the air, however, they appear to have been easy to control. When

SPEED AND ALTITUDE RECORDS

he made his record-breaking flight, Stainforth started the run from about twelve hundred feet over the Warner lightship eight miles away from the measured course, three kilometres long, and bounded at each end by two synchronized cine-cameras used to record his lightning passage. 'One is too busy watching for landmarks out of the corner of one's eye,' he says in his account, 'to look at the air-speed indicator, but the machine is probably flat out after about five or six miles. As we pass the second bump in the coastline—Brown Down point—the nose goes down steadily to a dive of about fifteen degrees . . . the machine loses height very rapidly, and almost as soon as the dive reaches its steepest, we have to start easing her out again. The object is to be as near the water as possible before the first mark boat. She . . . is now doing "a rate of knots". The revs have gone up a bit and one has a greater impression of speed than one usually gets in these aircraft. The houses at Lee slip by like trees by a railway line. I keep down as low as possible and try to finish the course at about twenty feet but am probably much higher owing to the fact that the surface looks a bit blurred, and one must leave a safe margin. The speed is still over four hundred miles an hour at the end of the three kilometres.'

A few murmured at what they considered a waste of time, money, and energy, but the vast majority of the country was exceedingly proud of these achievements. Soon both supporters and detractors of the High Speed Flight were to unite in a feeling of deep thankfulness; for the Hurricanes and Spitfires which were to save this country, and indeed the world, in 1940 might not have been evolved if aircraft designers and manufacturers had been denied the opportunity eight years before to put their theories into practice. By so doing they discovered many of the secrets of high-speed flight and its exacting requirements, and this knowledge stood them in vital stead when they were faced with the task of producing a fighting aircraft capable of winning a decisive battle.

One more achievement in the field of peace-time flight remains to be mentioned. At the end of September 1936 Squadron Leader R. D. Swain reached a height of 49,967 feet, a record for heavier-than-air machines. To enable him to go so high he was dressed in a special flying-suit made of rubberized fabric. On his head was a helmet with a large curved double window made of plastic. The upper part of the suit was gas-tight and oxygen was pumped automatically into it from one side and out of it from the other. Thus arrayed he climbed the skies until presently, looking down from a vast height, he was able to see the whole English Channel from Margate to Land's End, the north coast of France, and London with the Thames running to the sea. The sky itself appeared a deep blue, almost black. During the

HENDON AND EVEREST

descent he became faint and the window of his helmet clouded over, so that he could not see the instruments in his cockpit, nor was he able to find the rip-cord which would tear open his pressure suit. Eventually he succeeded in smashing the plastic window of his helmet with a knife. Fresh air streamed in and he recovered, to find himself above the pleasant town of Yeovil in Somerset.

Three years before this record, an expedition financed once more by Lady Houston and led by Squadron Leader Lord Clydesdale, with among its members Lieut.-Colonel L. V. S. Blacker, Flight Lieutenant D. F. McIntyre, and Mr. S. R. Barnett, had flown over Everest in two Westland aircraft. The flight was remarkable chiefly for the tremendous down-draught encountered near the summit of the mountain. 'The pilot,' says Blacker, who was the photographer of the expedition, 'swung the machine skilfully again towards the westward into the huge wind force sweeping downwards over the crest; so great was its strength that, as the machine battled with it and struggled to climb upwards against the downfall, we seemed scarcely to make any headway in spite of our 120 m.p.h. air speed. . . . We were now for a few minutes in the very plume itself, and as we swung round, fragments of ice rattled violently into the cockpit.'

In such ways as these, and above all at the annual R.A.F. Display which took place at Hendon and was witnessed by enormous crowds, did the existence of the Royal Air Force impress itself upon the man in the street. What was not so obvious were the months and years of steady training at Cranwell and Halton, during which, in accordance with Trenchard's plan, some few thousand men, one day to prove of incomparable value, learnt by means of instruments of ever-increasing precision to subdue the realm of air. Why there were not more of them, why the development of the Royal Air Force between 1919 and 1939 proved so difficult and in the end was accomplished with almost nothing to spare, will be discussed in the next chapter.

Cranwell had first become associated with aeronautics on the 1st April 1916, if a legendary leap of sixty yards by a prehistoric horse and an uncomfortable landing by two balloonists on the 7th October 1811 be ignored. Under the name and title of H.M.S. *Daedalus* a station for the training of R.N.A.S. pilots was set up there. By the end of the Four Years War its area covered more than three thousand acres, and several thousand officers had successfully passed its course of instruction. On the 5th February 1920 the college was recognized as the principal training centre of the R.A.F. 'You will have to work your hardest,' said Trenchard to the cadets there and then assembled, ' . . . in order to be capable of guiding this service through its early days and maintaining its traditions and efficiency in the years to come.'

THE CRANWELL TRADITION

Longcroft who, in 1913 with Sykes as a passenger, had made the first long-distance flight of the R.F.C., became its first Commandant. The traditions it sought to create and soon established were very simple. An officer who could not fly was useless for the general duties of the R.A.F.; but at the same time flying in itself, without any other accomplishments, was of no greater importance than 'riding in the Cavalry or marching in the Infantry'. During his two years' course the cadet learnt many things, ranging from aerobatics in the sky to science, engineering, history, and English in the lecture-rooms and laboratories. His activities have been accurately summed up in a parody of Chaucer which appeared in an early number of the College Journal. After describing his flying dress, his complexion, and his close-cut hair, the parodist informs us that

His flying filled his fader with affryt,
For scarce he seemed to remain upryte.

But spins, half rolls, and loops were reserved for week-days. On Sundays, wearing his best uniform, he marched to church, and 'listened to the Persoune and the Clerke'. But on all occasions

His buttons on parayde were always bryte,
His puttyes always laced were y-tight
And never fowle or muddie were his shoon;
Hee always did his preparacioun.

The College has been responsible for the training of very many gallant and successful officers whose names embellish its muster roll and who have helped to build the tradition of the Service by living up to its motto *Superna Petimus*.

At Halton the other ranks were submitted to an equally comprehensive training. The age of entry was low and apprentices began their career as early as fifteen and a half. Thus the process of creating the type of expert best fitted to the needs of the R.A.F. was made an integral part of the Service and Halton soon became its backbone by producing just that type of smart, efficient N.C.O. who is, and must be, the mainstay of any disciplined body of men. Not only did fitters, riggers, instrument makers, and wireless mechanics receive a very comprehensive training, but instruction was also given in all other trades necessary to the complicated working of a highly technical service. Both at Cranwell and at Halton the watchword was quality before quantity, and it was insistence day in and day out on this principle which assured the R.A.F. a standard of efficiency second to none. In 1939 and the years which followed, it was put to the exacting test of war and to the even more exacting test of a war which, throughout its early stages, had to be fought by a nation ill-prepared and consequently at a great disadvantage. That

THE BEST TRAINING

that disadvantage did not prove fatal to the Royal Air Force was due to the determination in the uneasy years of peace to impart only the best of training to the best of pupils.

As far as arms drill, saluting, general bearing and appearance were concerned the standard aimed at from the beginning and, it is generally conceded, attained, was that of the Brigade of Guards.

19. 'An Eagle Mewing her Mighty Youth'

IT will be remembered that the establishment in 1918 of the Royal Air Force as a separate Service had not been achieved without dust and heat. Neither the Admiralty nor the War Office had been willing to yield to the pressure of events which they were not by any means inclined to regard as inevitable. As might have been expected, therefore, it was not very long after the signature of peace that they began to stir and to question the wisdom of a decision taken amid the storm and stress of war. Now that the conflict was over, the Admirals and Generals found, like Othello, that their occupation was gone, or most of it. Having saved the State, what else was there left for them to do? They looked round and their eyes fell, not unnaturally, on the new Service and the new Ministry controlling its destinies. Had they after all been wrong to acquiesce in their creation? Was it really in the best interests of the country? No other nation possessed a separate air force. In France, in the United States of America, indeed, everywhere else, there were naval airmen and military airmen; there were not simply airmen separated from, and on an equal footing with, sailors and soldiers. Was not the majority of States, now members of the new-fangled League of Nations, wiser in this respect than Great Britain?

The War Office seemed for the moment doubtful or indifferent. Not so the Admiralty. For them their country seemed to be forgetting that 'it is upon the Navy, under the good Providence of God, that the wealth, safety, and strength of the Kingdom do chiefly depend'. They were genuinely concerned with the growth and strength of the Air Service. Here was a new organization, operating in an element uncharted and still largely unknown, with no age-old traditions to support it, using a multitude of machines and gadgets which seemed to become out of date almost before they were entered upon the official list of stores, and controlled by a separate Ministry of equal rank with their own more venerable institution. Was it about to usurp the cherished position of the Navy or, almost as bad, to prevent it from deriving the largest possible measure of benefit from that comparatively new invention, the flying machine?

As far as the Admiralty was concerned, the case for a separate Fleet Air Arm was very strong. In striving to win it they shewed themselves implacable; but to maintain that their actions between 1919 and 1938 were dictated by a narrow kind of jealousy would be to falsify the facts. They were at all times very conscious of their great responsibilities, and the unrelenting pressure which

they brought to bear on successive Governments to change a situation, thought by the Air Force to have been settled once for all in 1918, is to be explained by their equally unrelenting determination to do their duty whatever happened. It is in this light that their manœuvres in the decades which separated the two wars must be viewed. The Admiralty acted, not from spite, but from conviction. That must always be conceded. Some may think that they were wrong, but no one can, with justice, question their motives, for these were of the loftiest kind. Bearing this in mind, what happened?

Before 1919 was out the Admiralty were determined to change, if they could, the position as far as the Fleet Air Arm was concerned. The Royal Naval Air Service or something like it must be revived. That was the goal. To achieve it caution was essential; a direct, frontal assault was to be avoided and would perhaps prove unnecessary. At first it seemed that it would, for Lloyd George's Government showed a gratifying tendency to deprecate the importance of the new Service. One Secretary of State sufficed for both the Army and the Air Force; the War Office and the Air Ministry—not as yet installed in Whitehall, where it did not arrive until 1939—acknowledged but a single chief. True, he happened at the time to be Churchill, whose energies were dynamic, and who was, therefore, somewhat of an unknown quantity; but it was not to be forgotten that he had been First Lord and was possessed of a peculiar and extensive knowledge of naval problems, while he seemed, so the then Chief of the Air Staff recorded years later in his memoirs, 'to regard the R.A.F. merely as a useful adjunct to the two older Services and as an economical auxiliary for police work in the less civilized parts of the Empire'.

The first mild shock came in 1919 when Major-General Seely, Under-Secretary for Air, resigned his office. On the 17th November, he gave the House of Commons his reasons. In his view, no one, not even Churchill, 'with his boundless industry', could hold both portfolios. 'The War Office,' said Seely, 'is a whole-time job . . . and the duty of the Secretary of State for Air . . . is a whole-time job too. A man cannot be in two places at once'; and he went on to add that, apart from the waste of time, energy, and money involved, 'the fact that the Admiralty is left out of the business must make it difficult to work in with that great Department. How can the First Lord of the Admiralty appeal to the Air Ministry for a proper allocation of funds and a proper allocation of energy, with the infinite possibilities of air effort in regard to the Navy, when all the time he finds that the man he is addressing is the Secretary of State for War?'

CONTROL OF NAVAL AIRCRAFT

The Admiralty had no intention of appealing to the Air Ministry for anything if they could avoid it, for they were strongly of Foch's opinion that 'the principle of the absolute independence of the air is inadmissible'. For a time, however, they seemed unable to make this view prevail. On the 14th December 1921, a Select Committee on National Expenditure, presided over by Sir Eric Geddes, submitted a report in which the question of maintaining an independent air force was discussed, and the conclusion reached that 'without a separate existence' the Air Force would not be able to 'work out developments which might in the next decade or so entirely revolutionize methods of attack and defence'. If it were to succeed, then the Committee thought that 'very large economies in the cost of the fighting Services' might be made 'by substituting air for land and sea forces'. 'Very large economies.' The words had an ominous ring in the ears of men struggling to maintain at an adequate level of efficiency a Fleet of which the cost seemed altogether too high to the war-weary taxpayer. Moreover, at times they came under fire from their own side. Only a year or two previously Rear-Admiral Adair, who, entering the Navy in 1874, had by 1900 risen to command a coastguard ship in Southampton Water and should therefore have known better, had rounded on the Admiralty and accused it in Parliament of 'having been negligent in respect to the Air Force associated with the Navy'. 'Negligent?' When they were striving day and night to resume their lost control over it? It was very hard, and for the moment at least there was no break in the clouds. On the 16th March 1922 Austen Chamberlain confirmed in the House of Commons the determination of the Government to maintain a separate Air Service, and administered at the same time a sharp rebuke to another Rear-Admiral, Sir Reginald Hall this time, who, said Chamberlain, had boasted during a debate on the Naval Estimates that in the late war the Navy had got all the best machines and the best officers. Had such a distribution been made in the interests of the country? It had not. 'It was dictated by a fierce, inter-departmental competition in the market, the resources of which at that time were wholly insufficient to supply the Services. It was a haphazard and, therefore, a dangerous arrangement.' The implication was that never again should such confusion be allowed to arise, and that the Air Ministry existed for the express purpose of seeing that it did not.

Their Lordships in their historic board-room—it was to be a victim of air power in the next war—were equally determined; but their remedy was precisely the opposite of that adopted by the Government. They continued to press for the control of all naval aircraft and those who flew in them, and in July 1922 their

A COMPROMISE PROPOSED

pressure was such that a Sub-Committee of the then Committee of Imperial Defence was ordered to examine the whole question. Its chairman was the Marquess of Salisbury, and among its members were Balfour and Weir. Together with Lord Peel, they formed a Sub-Committee of the Sub-Committee and heard each side at length, not only on matters of detail, but also on 'the broad principles lying at the root of the policies respectively advocated by the contending parties'. It took them but a short time to discover that the controversy was 'somewhat acute'. The Air Ministry were quick to point out that hardly had their co-equal existence with the Admiralty and the War Office been achieved, when one of their elder brothers sought partially to dismember them by severing the Fleet Air Arm from the body of the Air Force. To do so would lead to endless difficulties of all kinds and much increased expense. The Admiralty were equally definite and maintained that for the 'air work', on which the safety and success of the Battle Fleet depended, to be carried out 'by persons belonging to another Service imbued by different traditions and looking for support and promotion to a different Department' was not to be tolerated.

Both sides had a very good case, and the problem was further complicated by the fact that while the Air Ministry raised, trained, and maintained the Fleet Air Arm, it was operated by the Admiralty and under its entire control when at sea in carriers which the Admiralty designed and constructed. After much consideration the Sub-Committee recommended a compromise. At least 30 per cent of the officers of the Fleet Air Arm should be naval officers, and the proportion could, if need be, be much higher. The only check was that not less than 30 per cent must be officers of the Royal Air Force. The solution may appear complicated, but, when put into practice, it soon came to mean that 50 per cent of all officers in the Fleet Air Arm were naval officers.

It might be supposed that this was the end, but it was not so. This was victory but not complete victory, and the Navy has never been content with less. The dispute continued in varying degrees of intensity, and echoes of it were sometimes to be heard in the Press and in the Commons, where the mantle of Rear-Admiral Adair had fallen somewhat askew on the shoulders of Commander Bellairs. Rarely did he miss the opportunities offered by the discussion of the Naval and Air Estimates to urge the division of the Royal Air Force between the Navy and the Army and the abolition of the Air Ministry. In so doing he wandered on occasion into wider fields and found himself under reproof from the Speaker or the Chairman of Committees for irrelevance and in conflict with Rear-Admiral Sueter, that sturdy champion

AIRCRAFT VERSUS BATTLESHIP

of the air, whom, suffering though he did from a similar bad habit, the Commander once unkindly described as 'the crimson rambler of debate'.

Outside the Chamber the issue was discussed on broader lines and the whole question of aircraft against battleship thrashed out by persons of distinction whose knowledge of the problem was almost entirely theoretical. By 1926 the Chairman of the Navy League was maintaining in a letter to *The Times* that 'it is exceedingly difficult for aircraft to hit with bombs or torpedoes when attacking undefended vessels. . . . In war the chance of hitting would be much more remote in view of the anti-aircraft guns and other defensive weapons of the battleship.' While it is possible that this contention might have been true at the time it was written, though the contrary had already been proved by experiments in the United States, the experts who supported it seem to have forgotten the possibilities of evolution. How great these were, and how short a time it took to develop the lethal qualities of torpedo-carrying aircraft, was to be seen fifteen years later when the *Bismarck* steamed in helpless circles, her rudders shattered by torpedoes of the Fleet Air Arm, to fall a prey to the heavy guns of the Home Fleet; when the *Liittorio* was left lying in the harbour at Taranto 'with a heavy list and her fo'c'sle awash', with two of her consorts and several cruisers in an equally precarious situation; and when the *Prince of Wales* and the *Repulse*, victims of a Japanese version of the same form of attack, went down in the sullen tropic seas off Malaya.

In 1926 the dispute for the possession and direction of the Fleet Air Arm was still unsettled, and not even the intervention of the Prime Minister was able to allay it. Fortunately for the country it does not appear to have extended to lower levels. As the years went by the co-operation of the officers and men of the Royal Air Force with their opposite numbers in the Royal Navy became so close and intimate that in 1935 during the debate on the Naval Estimates, it could be maintained that 'the finest example we see of co-operation between the Navy and the Air Force is in our aircraft-carriers'. This, however, was still not enough. Having come within sight of the goal, the Admiralty were not disposed to falter. They continued to serve their guns with greater resolution than ever, until at last they achieved their aim. Not only did they secure full control over all the officers and men of the Fleet Air Arm three years later, and over all the aircraft they used, but in 1937 operational control over Coastal Command, which had taken the place of Coastal Area Command. Having won their case, whether they then endowed the Fleet Air Arm with a constant succession of the fastest and most up-to-date machines embodying all the results of the latest

THE EFFECTS OF DISARMAMENT

scientific researches is, as King William IV was wont to remark, 'Quite another thing.'

It must not be thought that this long-drawn contest with the Admiralty was the only difficulty which beset the fledgling Air Force. In common with its sister Services, it was hampered at every turn by the indifference to all things to do with war manifested by a peace-loving people, who could be roused to fight only by an imminent and overwhelming threat to their liberties. Their temper is revealed clearly enough in the cold figures of the Estimates presented each year to Parliament. These were reduced to the lowest possible dimensions. On the 9th March 1922, for example, Captain Guest, then Secretary of State for Air, was able to inform the House of Commons that the Estimates which his Department had prepared were framed on the assumption that no great war was 'to be anticipated within the next ten years'. It was a correct, if unfortunate, assumption; for the prescient genius, who persuaded the Cabinet to base their policy upon it, had overlooked one factor, 'soon to prove of great importance. Provided other Great Powers held the same view concerning the probability of war, all would be well; but if, as events soon proved, they did not, then the British Government would certainly find itself gravely hampered in the complicated series of negotiations, constantly undertaken between members of the League of Nations, by the fact that it would be unable to back its opinion with force, if necessary. Its bark would always be worse than its bite, and that was exactly what happened. Lacking arms, Great Britain's powers of negotiation were seriously crippled; for, though her example may have been magnificent, the effect of it on ambitious and dissatisfied Powers, among whom the chief were Italy, Germany, and Japan, presently came to be the very opposite of what was intended. Far from following the precedent of disarmament, they took every opportunity to increase their own forces while rejoicing in secret, and on occasion almost openly, that, of the nations who might be expected to restrain them, one stood aloof on the other side of the Atlantic and another found it necessary to spend so high a proportion of her national income on social services, the dole and other domestic needs, that there was little left for the provision of arms.

Whether this policy was right or wrong is beside the point. Its effect on the Royal Air Force is only too easy to see. The Air Estimates of 1920 cost the country the equivalent of a fortnight's expenditure on the air in 1918. In other words, peace-time expenditure had been reduced to one twenty-sixth part of what it had been in time of war. This scale was regarded as adequate, and set the standard for subsequent Budgets. By 1923 the complacency of peace was slowly beginning to wear off, and the fact

BRITAIN WAS MORE VULNERABLE

that we were almost defenceless in the air was becoming apparent to a few, though certainly not to the general public. The Air Staff had had no illusions and had proposed in the previous year the creation of a force of fifteen squadrons for home defence. Taking all the circumstances into consideration, this was a modest figure. Only four years before it had required 400 fighters and 330 pilots, with 227 fighters and 165 pilots in reserve, to defend London against the attacks of a German bomber force which never exceeded forty machines. Since then the quality of aircraft had improved and the rate of improvement shewed no sign of diminishing. In other words, the United Kingdom and its capital were becoming steadily more and more vulnerable from the air. This situation was viewed by the Air Staff with the gravest concern. The home defence squadrons they proposed were designed to implement the Government's decision, taken in March 1923, to cause the Army and Navy to play secondary roles in defence against air attack. To those who found this force excessive, Lord Londonderry was able to reply in the House of Lords that only one-tenth of the total amount voted for the fighting Services that year had been allocated to the Royal Air Force.

It was already time for more drastic steps to be taken, and for the moment, with the advent of Bonar Law's administration in October, it seemed that they would be. Sir Samuel Hoare was given the post of Air Minister and in the following year proposed that the minimum number of squadrons comprising the home-based Air Force of Great Britain should be fifty-two. This figure was based on the recommendations of the Salisbury Committee which, as already related, had tried to solve the problem of the Fleet Air Arm. The new programme was announced to the House by Stanley Baldwin, who on the death of Bonar Law succeeded as Prime Minister on the 20th June. 'British air power,' he said, 'must include a home-defence Air Force of sufficient strength adequately to protect us against air attacks by the strongest air force within striking distance of this country.' This statement provoked from Lieutenant-Commander Kenworthy the sage reflection that the squadrons in question were useless for defence and could be used only for attack, since 'aeroplanes cannot attack aeroplanes at night', a view which he reiterated eighteen months later. Such an opinion was representative of the school of thought which took the view that there was virtually no defence against bombing aircraft, and which was content to ignore the phenomenon observable in most wars that new weapons of offence eventually produce their inevitable antidotes. The Air Staff were certainly at that time confident that fighter defence was possible provided always that there were fighters available. That was the difficulty. In October 1922, only nine months before Baldwin

SQUADRONS ON PAPER

made his statement, our total effective defensive strength amounted, according to Lord Londonderry's memoirs, to but twenty-four first-line aircraft.

Before any effective steps could be taken to implement the Government's plan, Baldwin's Administration fell and was succeeded by a Labour Government which, faced with the same problem, made a determined effort to tackle it on quite other lines. The instrument it chose was the League of Nations, which was to be made to work, or, rather, its members were to be persuaded to make use of it. In so doing, their armed forces, including naturally their air forces, were to be reduced all round. For one brief moment the Geneva protocol of 1924 seemed to offer a chance that the British Government would be successful and that international understanding would really be achieved; but it was rejected next year by Austen Chamberlain, Foreign Secretary in Baldwin's second Administration, and the question of providing an adequate number of home-defence squadrons loomed larger than ever.

It was many years, however, before the Air Ministry was within even distant sight of the goal enunciated on the 20th June 1923. Throughout the 1920s and the early 1930s retrenchment in public expenditure remained the watchword of every party in the State. By April 1930 Trenchard, then in the House of Lords, could inform his colleagues on its crimson benches that we possessed but 770 aircraft as compared with 1,300 in France, 1,100 in Italy, and 900 in the United States of America. Where, he solemnly inquired, were the fifty-two squadrons promised seven years earlier? The answer was that they were still for a great part on paper, though by the following year thirty-nine were ready and our air strength had reached 38 per cent and 44 per cent of those belonging to France and Italy respectively. Not even by 1932 had all the squadrons materialized, and by then the first faint lightning flashes, indicating the approach of the second World War, were visible below the horizon. Visible to anxious watchers, yes; but not to a people struggling hard against the rising tide of unemployment, and occupied with the numerous economic problems induced by a worldwide trade depression. They were still in no mood to spend money on air defence. More than that, in an effort to promote world disarmament, the Opposition went so far as to urge upon the Government the abolition of the fighting aeroplane altogether. 'We on this side of the House,' said Dr. Dalton on the 12th March 1928, 'view with grave concern the continued growth of offensive forces in the air. We view it with grave concern not only in this country, but in other countries', and his words found a ready response in many quarters. At that time the British forces in question were well below those

‘THE BOMBER WILL ALWAYS GET THROUGH’

which any Great Power, except Germany, possessed, and she was to remedy this defect six years later by building the Luftwaffe.

Throughout this period the Government hesitated. Its lack of arms and consequently of bargaining power made it unable to give a major lead at Geneva and it seemed equally unable to do so in London. Yet the conclusion is hard to escape that, at least as far as the air was concerned, it was in the position of the man in the oft-told tale who, when asked why he was running after a crowd, replied that he had no other course open to him since he was their leader.

It was not until 1932 that the ordinary man began to consider seriously the possibility that one day, not perhaps far distant, he might become a victim of air warfare. On the 10th November in that year Baldwin expressed his considered opinion that ‘the bomber will always get through’, and he added that the attempts of the League to mitigate or remove the menace of the air by reducing the size of aircraft or prohibiting the bombing of the civil population reduced him to despair. ‘Will any form of the prohibition of bombing, whether by Convention, Treaty, or Agreement, or anything you like, be effective in war?’ he asked, and answered his question in the same breath by saying that in his view ‘the stern test of war will break down all Conventions’. A few years later and he was to be proved tragically right. At the time he made this statement the Disarmament Conference had already been in session for more than nine months. In its success lay the only hope of any Government to achieve the safety of Britain by international means. If it failed, then, whatever the cost in money or in reputation, the defences of the country would have to be put in order. The fate of the Disarmament Conference was, therefore, of the greatest importance to all three Services, and especially to the Royal Air Force, who had charge of the new weapon capable, it was already surmised, of producing death and disaster on a scale which Attila might have envied and Genghis Khan been unable to surpass.

In 1932, on a dark February day, the second of the month, the Conference finally met in Geneva. The preparations for it had been in the hands of a Preparatory Commission which had sat on and off since 1925. For seven years it had been in slow gestation and had eventually produced a ridiculous mouse in the form of a Draft Convention, conspicuous mainly for an almost total lack of the only element which mattered, concrete figures of reduction, and also for so large a number of ‘derogations’, as they were called, that it was exceedingly difficult, if not impossible, to determine what effect, if any, its adoption would have on the armaments of the world. It was soon evident that the Powers attending the Conference were agreed upon but one thing, not to disarm,

though many of them were in the position of 'letting "I dare not" wait upon "I would".' Months were devoted to talk and manœuvring in the drab disarmament building with its rubberized floors, its olive-green chairs, and its grey paint matching the greyer lake visible through the tall windows. The colour of the lake had changed to blue in the sunlight of a limpid April when, for one moment, with the arrival in the city of Calvin of the French Prime Minister, Monsieur Tardieu, of the British, Mr. Ramsay MacDonald, accompanied by Lords Londonderry and Hailsham, Secretaries of State for Air and War respectively, of Signor Grandi, the Italian Foreign Minister, and, last but not least, of Dr. Brüning, the German Chancellor, it seemed that agreement might be possible. But the moment passed. A few months later Brüning was out and Hitler in, and the war of revenge which had been in the minds even of seemingly democratic statesmen such as Stresemann,¹ became a certainty.

Nevertheless the Conference struggled on, and the British Delegation made persistent, sometimes misguided but always determined, efforts to achieve a positive result. It was hampered from the very beginning by the policy of unilateral disarmament pursued for so many years. John Simon, Anthony Eden, and their expert advisers could do no more than point to the good example set by their own country. The other members of the Conference, more particularly France, remained unimpressed, especially by the air proposals which were regarded by the majority as a fine example of what was meant by the old, but not outworn, phrase, 'Perfide Albion'.

The British Delegation finally produced a Draft Convention in which was set down the amount by which each country should reduce its Navy, Army, and Air Forces. The air clauses, which alone would affect the Royal Air Force, were probably the least fortunate part of this remarkable and sincere proposal. The whole crux of the problem lay in the use of the bomber. Its abolition would prevent an aggressor State from using it either as a long-range gun or—and this was infinitely more dreaded—as an instrument for delivering a mass attack within a few minutes of the outbreak of war. The Preparatory Commission had confined itself to a number of platitudes on this subject which may be summed up in two sentences from its draft. 'All air armaments can be used to some extent for offensive purposes', and 'air bombardment is a grave threat to civilians'. At first sight the British Draft went much further and proposed that air-bombing should be prohibited except for 'police work in outlying regions'. It was this exception

¹ See his letter written just before the Locarno Conference to the ex-Crown Prince, quoted by Major-General A. C. Temperley in *The Whispering Galleries of Europe*, p. 40.

PROPOSALS AND COUNTER-PROPOSALS

which, as other States were quick to point out, nullified the prohibition. What, for example, was meant by 'outlying regions'? When did they cease to be outlying? Even if they could be defined, how could a State be prevented from keeping a large force close to those regions and then in the event of war bringing it nearer home for use against a neighbour's capital? The proposal was vigorously defended by Lord Londonderry, whose arrival in Geneva in a Fairey III F single-engined reconnaissance bomber, seemed to some an outward manifestation of Great Britain's determination not to abandon a weapon which enabled her so largely to reduce the running-costs of Empire.

For a moment it appeared that the British desire to retain the bomber for use against hostile tribes—to control them by this means was generally regarded as cheap, effective, and, on the whole, humane—might prove a major obstacle to the success of the Conference. As the weeks and months dragged by, however, many other considerations arose which drove this into the background. In the end the British Government gave way and authorized Anthony Eden to say that, if the retention of the bomber was all that stood in the way of agreement, it would not insist. By then, however, it was too late. The bomber was a nail, and a large nail, in the coffin of the Conference, but it was not the only one. The other British proposals concerning the air were a limitation of the size of aircraft to three tons weight, and an allocation of a maximum number of 500 to each Great Power save Germany, which was to have none at all. Such a proposal naturally violated the principle of equality on which Germany had insisted from the beginning. Moreover, it gave little satisfaction to other nations, for, since by that time Great Britain was but fifth on the list of air Powers, it seemed that once more she was striving to obtain an advantage for herself at the expense of the rest.

The reductions in air armaments proposed by other States were in some respects more drastic than our own. France, for example, was in favour of a very complete scheme of which the object was to internationalize civil aviation. It was to be controlled by an International Board which would run all main airlines on a commercial basis. Such a system would, the French maintained, make impossible the accumulation of reserves of pilots or aircraft in any one country for war purposes. To this proposal the British Government was for some reason unable to consent, urging instead that civil aircraft should be registered and that some form of international inspection, to ensure that they did not exceed in size the prescribed limitation, should be instituted.

Such were, in brief, the proposals and counter-proposals discussed by the abortive Disarmament Conference during the years 1932, 1933, and 1934. It reached no conclusions and its work failed.

The British Government of the day, in the company of others, must bear a share in the consequences of that failure; but it would be very wrong to place it in the front of the dock. Hampered as it was at every turn by having already carried out a measure of disarmament far larger, not only than that achieved by other Great Powers, but also than that proposed even in the most drastic of the draft conventions considered by the Conference, it had fought tenaciously to reach some measure of disarmament. Only when failure was complete and obvious did it turn with great reluctance to the task of increasing the Royal Air Force.

In March 1934, during a debate on the Air Estimates, Baldwin made a very clear and definite statement. 'This Government,' he said, 'will see to it that in air strength and air power this country shall no longer be in a position of any inferiority to any country within striking-distance of our shores.' On the 19th July of that year he informed the House that the strength of the Royal Air Force would be increased by forty-one squadrons in the course of the next five years. This would bring its first-line strength all over the world to 128 squadrons. By November, however, the Government felt that this programme was not sufficiently bold, and decided to hasten matters by forming in the next two years twenty-two of the squadrons reserved for home defence, while at the same time adding three more to the Fleet Air Arm.

It was still evident, however, that they were not without hope that some improvement might yet be brought about in the international situation. True, Germany had by now withdrawn from the League and, at the very moment we were discussing the measures contemplated for increasing the Air Force, had published her defence estimates for 1934. These shewed an increase of 250 per cent in the air, which she explained by saying that it was for civil aviation only, a statement which deceived no one. True, too, that on the 17th April the French Foreign Minister, Monsieur Barthou, that autumn to die at the hands of an incompetent assassin and a still more incompetent practitioner of first-aid, had dealt the final blow to the Disarmament Conference in a speech which in violence and irony, insolence and passion, had rarely been equalled and never surpassed at Geneva. Yet the Government still hoped, and early in 1935 sought, to achieve between the signatories of the Locarno Treaties a Western Air Pact which would limit air forces. On the 3rd February the Governments of Great Britain and France concluded the London Agreement under which Italy, Germany, and Belgium were invited to negotiate a Convention on the same lines. Germany's reply was to ask for the dispatch of British representatives to Berlin. John Simon and Anthony Eden prepared to set out for the

HITLER FORMS AN AIR FORCE

German capital, and once more it seemed that at the last moment some kind of settlement might be achieved, when on the 4th March the British Government published a statement on defence containing more than one reference to Germany and revealing the fact that her rearmament was 'unabated and uncontrolled'. That the statement was true in substance and fact cannot be denied, but to publish it at that moment was certainly a tactical error. It would appear to have seen the light of day purely as the result of Parliamentary routine, having been issued in order to be placed in the hands of members a few days before the debate on the country's defences took place. Hitler's reaction was immediate. He developed a severe cold and expressed himself unable to meet either Simon or Eden. It was then the turn of the French Government to move and it forthwith announced that the period of conscript service with the Colours would be increased from one year to two. Hardly had it done so, when Hitler who, according to his own admission, moves 'with the certitude of a somnambulist', proclaimed the formation of an air force. Nevertheless, despite the general atmosphere of hostility and suspicion now prevailing, the two British Ministers visited Berlin, where they were informed by Hitler that Germany's air strength was already equal to that of Great Britain and that she intended to make it equal to the home-based and North African air forces of France. He seems at that time to have taken so little trouble to conceal his vision of future events that on the 19th March Berlin experienced a trial black-out and was thus the first city in Europe to rehearse what was, less than five years later, to be the common fate of every town and village in that continent. It is doubtful whether the information Hitler gave to Simon and Eden was, in fact, true. The Luftwaffe had only begun to expand and was still inferior in numbers to those of the French and British air services. In March 1935 the number of Luftwaffe squadrons actually operational was only one. It was soon to be very many more, for Goering, Milch, and the other German leaders began from that moment to build with the utmost energy. They could do so without let or hindrance from any opposing party.

Our own expansion was a more difficult matter. On the 22nd May 1935 proposals were laid before both Houses of Parliament which would have the effect of raising the number of first-line aircraft to 1,500 by 1937. It should be explained, in passing, that the term 'first-line' has always been used by the Air Ministry to connote machines available to operational squadrons, ready to take the air immediately; it does not include reserves. The effect of this scheme would have been almost to treble the force in twenty-four months. These proposals were accorded a mixed reception. They came as a shock to many who, up to that moment,

BRITAIN BEGINS TO REARM

had, consciously or unconsciously, refused to face the possibility that another and even more ghastly war might be in the offing. Even the 6,784,038 persons who had voted *Yes* to the third question of the Peace Ballot, held at that time in an effort to discover the mind of the nation on international affairs, 'Do you consider that if a nation insists on attacking another, the other nations should combine to compel it to stop . . . by, if necessary, military measures?' did not all view with equanimity the prospect of having, perhaps, to implement the implied threat. The official Opposition concentrated its attack on Lord Londonderry, who, it said, in a manifesto, had 'boasted of preventing an agreement for the complete abolition of all national air forces'. Dr. Dalton went further, and soon after the Italian occupation of Abyssinia, accomplished largely as the result of spraying many thousands of men, women, and children with blister-gas from the air, declared that Lord Londonderry had prevented the abolition of the bombing aeroplane for the benefit of Hitler and Mussolini. This was but the cut and thrust of party politics. The facts were that without a general measure of disarmament which the Conference on that subject had utterly failed to bring about, any control of air forces by any Government of any country was rapidly becoming out of the question. In default of international agreement, national expansion in a last effort to achieve national security was the only alternative, and into this course the British Government was reluctantly driven.

It was presently aided and abetted by the Opposition. On the 25th May 1938 their spokesman, Dalton, moved for 'a complete and searching, independent inquiry' into the air defences of the country, and sought to lay bare the deficiencies of the aircraft industry in general and of the Air Ministry in particular. Defending Lord Swinton, whom he had just dismissed from the position of Secretary of State for Air, the Prime Minister, Neville Chamberlain, pointed to 'three indispensable pieces of preparatory work' which had been accomplished. They were: experiments to discover the best possible types of aircraft, the adoption of a scheme for increasing the number of serving officers and men in the R.A.F., and the construction of new aircraft factories. The first, he said, had provided the Hurricane and Spitfire, capable of flying more than 300 miles an hour, and he proceeded to compare them with the Bulldog of 1929 whose maximum speed had been but 163 miles an hour, and the Gauntlet of 1935 which could reach 230; the second had been the creation of thirteen Civil schools and eleven Service schools by which the numbers of the R.A.F. would be multiplied by seven, and the third had produced 'shadow' factories which would give 'an enormous increase of productive capacity in war'. Sir Archibald Sinclair and Winston

Churchill were among those members unconvinced that all was reasonably well, and both of them, though animated by somewhat different motives, pressed for the establishment of a Ministry of Supply, while Moore-Brabazon lamented that Lord Swinton, like the goose in the fairy tale, had laid a golden egg, the proposed programme of expansion, and had then been dismissed for failing to lay another. The motion was eventually lost by 329 votes to 144, but the Debate revealed to the country the uneasiness of Parliament, its traditional watchdog, upon whom the coming events had begun to cast their dismal shadows.

It is at this point that it will be useful to consider briefly the equipment at the disposal of the Royal Air Force. The war of 1914-18 had shewn conclusively that mere numbers in the air could not make up for lack of technical efficiency. This was very clearly understood by the Air Staff which, in accordance with the principles laid down in Trenchard's memorandum of 1919, had concentrated on the production and maintenance of a force equipped with the best possible machines, flown by pilots trained to the highest pitch. Mention has already been made of the Schneider Trophy contests, and it will be remembered that they were all won by Supermarine seaplanes. From these remarkable aircraft, notably those which won the race outright in 1931, enormous advances were made in the direction of producing a reliable high-speed machine, in other words, a fighter which, powerfully armed, might make a vital contribution to winning the mastery of the air.

Since 1919 the firm producing Supermarine aircraft had changed hands more than once. Successive owners had, however, always retained in its employment Reginald Joseph Mitchell, who had in 1920 become chief engineer and designer. The brilliance of his work was first publicly recognized in 1927, when the Aeronautical Society bestowed upon him its Silver Medal. It was Mitchell who was responsible for the new fighter, and he had been impelled to design it very largely as the result of what he had heard discussed in the Austrian village of Kitzbuhel. During the winter of 1934-5 he had spent some time there seeking the health denied to him—he was to die two years later from cancer—and had come into contact with many well-informed Germans and members of German glider clubs. His talks with them convinced him that a secret German air force had been planned and was, even then, in process of construction. He returned to England with the conviction that Germany meant to dominate the air. That Great Britain was almost defenceless against air attack he already knew or surmised, and he therefore at once set about designing a fighter which would prove a decisive weapon. The Air Ministry, he found, had

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commissioned such an aircraft and, following their specifications, he soon produced the F 7/30. It was unable to reach a speed of 250 miles an hour and had, therefore, to be judged a failure. Mitchell was undismayed. He asked for, and was given, a free hand both by the Air Ministry and by Vickers. In a very short time he had designed and built the first Spitfire. This machine, powered by a succession of engines built by the firm of Rolls-Royce, each more powerful than the last, began by reaching, with a fixed-pitch propeller, a speed of 340 miles an hour at 17,500 feet. That was in 1936, and its performance steadily grew in excellence during the next few years. In 1937 Mitchell died at the early age of forty-two, worn out by his malady and his incessant and ungrudging labours. He had designed not only the all-conquering Spitfire, but the Stranraer, Southampton, and Walrus flying-boats of admirable performance in their day. 'He was a man,' said Sir Robert McLean, the head of his firm, 'who was always trying to peer just over the horizon.' This capacity to see just a little farther than any one else was to stand his country in good stead. In 1940 Mitchell, though dead, played a decisive part in its salvation, and his name must be inscribed very high on the roll of those whose inventive skill, bright genius, and selfless devotion have maintained the cause of England, and, therefore, of freedom.

Another machine of outstanding merit, the Hawker Hurricane, was also developed about that time. Though slower than the Spitfire, it was still very fast, fast enough to deal with any hostile bomber which it might encounter. Together with the Spitfire it won the Battle of Britain. Both machines were fitted with eight .303 Browning machine-guns housed in the wings and firing outside the arc of the propeller. This in itself was a revolution, for it conferred overwhelming fire-power on a very fast machine. Nothing, it was hoped, could withstand the concentration of bullets, fired at the rate of 9,600 a minute, which could thus be brought to bear upon a hostile aircraft. It was upon these two main types that the Air Staff relied for fighter defence, and with them was the well-tried Gloucester Gladiator, a fast biplane, and later the Boulton Paul Defiant and the Westland Whirlwind. It took a long time, however, to equip squadrons with the new types. At the time of the Munich Conference in 1938, for example, only one squadron in the whole Air Force—No. 19—possessed Spitfires.

Without entering into technical details, it may be said that in general the development of the aeroplane between 1918 and 1939 was in the direction of the low- or middle-wing monoplane. The advantages of this type were numerous. It was faster; the undercarriage could be more easily retracted; and the absence of struts and bracing wires meant less interference with the air-flow. Another technical development was that of the variable-pitch

propeller whereby the angle of the blades could be altered, thus enabling designers to construct machines with a heavier wing-loading. This in turn led to the adoption of flaps attached to the trailing edges. These served as air brakes and as additional wing area which increased lift at the take-off and at low speeds. 'With these changes came the mass of additional instruments and controls. For blind flying there were the sensitive altimeter (recording changes of height ten feet at a time), the artificial horizon, and a turn and bank indicator; on the mechanical side there were extra engine dials, a knob to control the propellers, a pump or motor to operate the flaps and another to deal with the undercarriage, petrol gauges, thermometers, and pressure gauges. The cockpit would have staggered any pilot of the old days who worked well enough with an altimeter, air-speed indicator, compass, and clock. There still remained all the accustomed extras like generators, oxygen meters, and trimming gear, besides wireless, throttles, rudder bar, and control column, so that what the pilot often referred to as "gubbins" had multiplied itself several times.'

As has been said, it took some considerable time before the Royal Air Force possessed Spitfires and Hurricanes in any quantity. The delay, inevitable, grave but not disastrous, was due to lack of manufacturing facilities. The necessary plants and machine tools for the production of aircraft on a large scale were not immediately available. Privately owned factories, to which Government plants were to be added, were designed and built, but it was not until the next war was well advanced that they were in full production. Many of them were known as 'shadow' factories, which were not to come into use until war was a grave threat or an accomplished fact.

Mistakes and delays were inevitable, but one mistake was not made. The standard of equipment and training was maintained throughout at the highest possible level, even though such a policy meant reducing the rate at which aircraft could be manufactured. The importance of this decision is hard to exaggerate. It would have been easy with our manufacturing resources to produce large numbers of machines in a comparatively short period of time, but they would have been obsolescent. It was in this that Goering made what future historians may describe as a fatal blunder. So eager was he to produce a large air force in the shortest possible time, that he concentrated on a few well-trying types, of excellent, but not superlative, performance. Our own policy was very different. We were ever straining after perfection and were rarely satisfied that we had attained it. The result was that when the moment of expansion arrived, the only aircraft approaching obsolescence handed over to the Shadow Factories for production in quantity, was the Fairey Battle, a reconnaissance

BOMBER AND RECONNAISSANCE TYPES

bomber, abandoned except for certain duties with Coastal Command before the end of 1940. Performance before numbers was the motto of the Air Staff, or, as a recent writer has put it, 'we entered the winning horse, though Germany had a much bigger string in her stables'.

These schemes and their realization applied equally to bombers and reconnaissance machines. The exhaustive experiments conducted by the Germans and Italians during the Civil War in Spain, which their Governments had done their utmost to provoke, seems to have convinced their Air Staffs that the heavy bomber could not hold its own in combat against the fighter. They accordingly relied for protection on speed rather than on armament. In 1935 the Germans put into production the Heinkel 111K which had the merit of being able to fly faster than any other bomber and the defect of being almost defenceless against a Spitfire or a Hurricane. It had but three machine-guns, trained and operated by gunners who had to use their muscular strength for the purpose. Our own Air Staff took an opposite view and boldly decided to provide our bombers with power-operated turrets driven from the engines and capable of being swung through wide arcs at a touch of the hand. They could mount one, two, or four machine-guns and were fitted in the four standard types of twin-engined bombers, the Bristol Blenheim, a medium bomber, the Vickers Wellington, the Handley Page Hampden, and the Armstrong-Whitworth Whitley. Of these machines the most remarkable was the Wellington, built on geodetic lines with fabric stretched over trellis-like wings and body. For reconnaissance over the seas, therefore for the equipment of Coastal Command, the main aircraft were the big four-engined Short Sunderland flying-boats, the smaller Saro Lerwick, and the obsolescent Vickers Stranraer. These were supplemented by the Avro Anson and the Bristol Beaufort, both land machines, and by a few Lockheed Hudsons, a handy American aircraft. For reconnaissance and army co-operation there were the Westland Lysander and the Fairey Battle, and, for training, half a dozen excellent machines ranging from the Phillips & Powys Master to the De Havilland Tiger Moth.

It was with aircraft such as these, whose places were presently to be taken by others of still greater size and power, that the Royal Air Force began reluctantly, but with determination, to prepare for war. The shortage of officers and men had always been a problem. To solve it the Auxiliary Air Force was created in 1925 as the result of legislation passed in the previous year. It consisted at first of four squadrons of aircraft, but was later to include balloon squadrons and by September 1939 twenty of the first and forty-four of the second were ready. The

THE AUXILIARY AIR FORCE

officers and men composing it were recruited for a minimum period of five years by the local Territorial Associations, their members being drawn, like the Territorial Army, from the district nearest each man's home. The squadrons they joined were affiliated to towns or counties, which soon began to take the keenest interest in their growth and welfare. The civic or rural authorities vied with local employers in their efforts to ensure that the officers and men of the Auxiliary Air Force should be given the necessary means and time to train. All training was carried out after working hours and at week-ends, and much of their annual holidays was spent passing through a fortnight's intensive instruction. At first the raising of such squadrons was regarded as an experiment, about which opinions were very mixed, but it soon shewed itself to be an outstanding success. By 1930 thirteen squadrons had been raised and equipped, and in the air exercises of that year showed remarkable skill and efficiency. Not a little of this was due to the spirit of emulation which animated the squadrons, especially those belonging to such cities as Edinburgh and Glasgow. When the next war came they were to share the honours of destroying the first German bomber to be shot down by the Royal Air Force. Both squadrons were in action on the 16th October 1939 against Heinkels raiding naval vessels in the Firth of Forth, and two of the enemy fell to their guns. Less than a year later the County of London Squadron, No. 601, had destroyed more than a hundred German aircraft. The balloon squadrons were formed later, and between May 1938 and September 1939 no fewer than forty-four came into existence. Balloon sites were established round the most vulnerable targets, particularly the ports and arsenals.

In addition to the Auxiliary Air Force, the Royal Air Force Volunteer Reserve was formed in July 1936. This, too, was composed of civilians recruited in the neighbourhood of aerodrome centres and confined to men of between eighteen and twenty-five years of age. It was originally designed only for air crews, and when war broke out was employed as the principal means of entry into the Royal Air Force.

Women, too, were to play a part in the activities of the Royal Air Force. On the 28th June 1939 the Women's Auxiliary Air Force was formed by Royal Warrant. It took the place of the Royal Air Force Companies of the Auxiliary Territorial Service which had been created rather more than a year before. The W.A.A.F. was eventually placed under the direct command of the R.A.F. and its main object was to substitute women for men in many trades of the Service. In 1939 these numbered but five. A year later they had risen to twenty-six.

Thus did the Royal Air Force plot, plan, and prepare for a

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struggle which its chiefs, as soon as they realized the extent of German rearmament, had been forced to regard as inevitable. In one respect, at least, they were superior to their potential enemy. In those last feverish years of peace, when civil war raged in Spain and China, when France was torn with internal strife which sapped and then ruined her strength, when first the Demilitarized Zone of the Rhineland, then Austria, then Czechoslovakia, fell into Hitler's grasp, Goering was striving with might and main to re-create an air force out of nothing save a few civil pilots and a large number of gliding enthusiasts. That he succeeded in producing so formidable a force as the Luftwaffe in so short a time must be put to his credit. The Royal Air Force was more fortunate. It had been in existence under different names since 1911 and already had behind it an unsurpassed record of achievement. This was now to prove of incalculable value. Though comparatively few in number, its aircraft were of admirable construction and of the latest design. Those who flew them had the advantage of highly specialized training at the hands of instructors who were experts to a man, and had all passed the exacting tests of the Central Flying School. Trenchard's foresight was about to bear fruit. Above all, in the twenty years between the two wars the Royal Air Force had been employed all over the world, and in this had gained much flying experience. Whatever the *pros* and *cons* of keeping the King's peace on the frontiers of the Empire by means of R.A.F. machines may have been, their pilots had learned many important lessons from which the whole nation was soon to profit.

At home frequent air exercises maintained efficiency. In August 1938, for example, 945 aircraft were engaged in a mimic battle which lasted several days. 'Eastland', under the command of Air Chief Marshal Sir Edgar Ludlow-Hewitt, with a bombing fleet of thirty-six squadrons, attacked 'Westland', under Air Chief Marshal Sir Hugh Dowding with twenty-three fighter squadrons. (A year later the first was to send his bombers to Wilhelmshafen and the mouth of the Elbe, and two years later the second was to fight one of the decisive battles of the world above the fields of southern England.) Air-raid precautions, including black-outs, were imposed in the area of the exercises, and all civil aircraft grounded throughout its duration. The whole elaborate control system, including the new invention known as radio-location, was put into operation and thoroughly tested. The results, kept secret at the time, were held to be highly satisfactory.

By then the sands were running out, and with the last fleeting, fevered hours of peace this story of the growth of British air power must end. From the first uncertain beginning, when the only way to be sure that an aircraft had left the ground was for the spectator

to lie flat on his stomach with his head turned sideways in order to see whether there was any interval between its wheels and the grass, the Royal Air Force had developed into the most formidable air striking-force in the world. How it did so, and how it was then allowed to dwindle in time of peace until it reached a condition in which its power had ceased to be of account among the nations, has now been told. Yet despite every set-back, every disappointment, every misfortune which the years from 1918 to 1939 held for it, it was too robust to perish. Or rather let it be said that the seed of its second growth did not fall only upon stony ground. Enough took root and flourished so that by 1939 the plant was once more growing though it needed the stimulus of war to bring it to maturity. When in September of that year the test came, the Royal Air Force, many times outnumbered, was ready and able to fulfil, not the role for which it had been designed—that was to come later—but to capture ‘time’, a feat of even greater import. ‘If time be,’ says Mahan, ‘as is everywhere admitted, a supreme factor in war, it behooves countries whose genius is essentially not military, whose people, like all free people, object to pay for large military establishments, to see to it that they are at least strong enough to gain the time necessary to turn the spirit and capacities of their subjects into the new activities which war calls for.’ Though we possessed all the characteristics he mentions, this we were nevertheless able to do. ‘Walled towns’, in the opinion of Francis Bacon, ‘stored arsenals and armouries, goodly races of horse, chariots of war, elephants, ordnance, artillery, and the like: all this is but a sheep in a lion’s skin except the breed and disposition of the people be stout and war-like.’ War-like we are not, and it was the enemy rather than ourselves who possessed in profusion the ghastly implements of that barbarous trade. But stout we proved ourselves to be from that moment, fifteen minutes after the declaration of war, when for the first time the sirens wailed through English air. Then the people arose in their greatness and, as trial succeeded trial, and disaster disaster, the old stood firm, the young went forth to war, surmounted defeat at Dunkirk, maintained dominion over the seas, and in the high fields of air fought and won the Battle of Britain. By 1941 the Royal Air Force had gained that necessary, that vital, ‘time’ and from that year onwards its might, displayed over Germany and enslaved Europe, over Italy and Africa, over the Mediterranean, the Bay of Biscay, and the Atlantic, was certain one day to light its wings with victory.

In the summer of 1938, however, all this was still in the future. A last despairing effort was being made to keep a peace which by then had passed all understanding. A worn and tragic Prime

IT WAS WAR AGAIN

Minister flew first to Berchtesgaden, then to Godesberg, then to Munich, in a vain but conscientious endeavour to avert a doom approaching with the relentless momentum of an Aeschylean tragedy. Despite the efforts of more than one organ of the Press in more than one country to create reality out of desire by reiterating daily their conviction that there would be no war, men and women all over Europe began to steel themselves to take part in a conflict whose nature their imaginations, sharpened though they had been by events in China, Abyssinia, and Spain, found difficult to depict. Gloom and anxiety, lit by false and febrile gaiety, walked the streets of every capital of Europe, even those of Nazi-haunted Vienna. In arsenals from Kiel to Toulon, in factories from Belfast to Breslau and beyond, the sound of the electric rivetter echoed night and day and the whirling lathes were never still. The Junker smoothed the creases of his uniform, the German General Staff put aside its Kriegspiel for a deadlier game, while diplomats choked the international trunk-lines with agitated telephone calls, and overwhelmed tired-eyed cypher clerks with ever-gloomier telegrams. On the 1st September 1939 German mechanized columns, with the roaring wings of the Luftwaffe overhead, moved eastwards against Poland, while in Berlin an insolent Foreign Secretary, in his high-pitched voice, gabbled terms, which no one had had any opportunity to examine, to a British Ambassador, the patience of whose Government was at last exhausted. At eleven o'clock on the morning of the 3rd the British ultimatum expired, and a few hours later a reluctant French Prime Minister, and a still more reluctant Foreign Secretary, had followed the lead of their Ally. It was war again. Once more Germany was on the march, determined to push all 'to the extreme edge of hazard'.

APPENDIXES

I

OFFICERS AND NON-COMMISSIONED OFFICERS OF THE R.N.A.S., R.F.C., AND R.A.F., WHO WON THE VICTORIA CROSS IN THE WAR 1914-1918

	<i>Date Gazetted</i>
Ball, Captain Albert, D.S.O., M.C.	8 June 1917
Barker, Lt.-Col. William George, D.S.O., M.C.	30 November 1918
Beauchamp-Procter, F./Lt. Andrew Wetherby, D.S.O., M.C., D.F.C.	30 November 1918
Bishop, Lt.-Col. William Avery, D.S.O., M.C., D.F.C.	11 August 1919
Davies, Captain Richard Bell, D.S.O., A.F.C., R.N.	1 January 1916
Hawker, Major Lance George, D.S.O.	24 August, 1915
Insall, W./C. Gilbert Stuart Martin, M.C.	23 December 1915
Jerrard, F./Lt. Alan	1 May 1918
Liddell, Captain John Aidan	23 August 1915
McCudden, Major James Thomas Byford, D.S.O., M.C., M.M.	2 April 1918
McLeod, Lt. Alan Arnett	1 May 1918
McNamara, Lt. Frank Hubert	8 June 1917
Mannock, Major Edward, D.S.O., M.C.	18 July 1919
Mottershead, Sgt. Thomas	12 February 1917
Rees, G./C. Lionel Wilmot Brabazon, O.B.E., M.C., A.F.C.	5 August 1916
Rhodes-Moorhouse, Lt. William Barnard	22 May 1915
Robinson, Captain William Leefe	5 September 1916
Warneford, Flight Sub-Lieut. Reginald Alexander John	11 June 1915
West, S./L. Ferdinand Maurice Felix, M.C.	8 November 1918

II

AIR FORCE RANKS COMPARED WITH NAVAL AND ARMY RANKS

Marshal of the R.A.F.	Admiral of the Fleet	Field Marshal
Air Chief Marshal	Admiral	General
Air Marshal	Vice-Admiral	Lieutenant-General
Air Vice-Marshal	Rear-Admiral	Major-General
Air Commodore	Commodore	Brigadier
Group Captain	Captain	Colonel
Wing Commander	Commander	Lieutenant-Colonel
Squadron Leader	Lieutenant Commander	Major
Flight Lieutenant	Lieutenant	Captain
Flying Officer	Sub-Lieutenant	Lieutenant
Pilot Officer	Midshipman	Second Lieutenant

III

AN EARLY AEROPLANE RECONNAISSANCE

15 JANUARY 1911

THE following is an account extracted from the diary of Monsieur H. M. Jullerot of the aeroplane reconnaissance carried out by himself and Captain William Brancker (observer) during the Indian Manœuvres of 1911. The flight took place on 15 January and the aeroplane was attached to the force of Sir Douglas Haig, which was in pursuit of the retreating 'enemy'.

To-day we are out before daybreak and find the camp quite deserted—no troops anywhere. Colonel Watson, commanding the Cavalry Brigade, sends a message that he has lost contact with the enemy for five hours. Therefore, with the first gleams of the sun showing up the graceful form of the feathery palms on the eastern horizon, we are ready, and our machine rises softly from the ground and directly drives into the early rays of the Indian sun, which makes one of the most gorgeous sights I have so far beheld. Turning towards Aurangabad Station we pass over a group of officers who wave their topees to us. We learn afterwards that they were the staff of Sir Douglas Haig. Well, I look back to Captain Brancker, who seems to enjoy himself so far, and points a direction to me. We see clearly on both sides of us hill ranges, which provide us with the best landmarks one could wish. The wind is quite fresh and dead against us, so our progress is very slow. We see nothing in front of us except a wide deserted stretch of yellow land and dried-up vegetation. I look round to my left and perceive in the distance a small white speck, which I localize as the Mosque I visited the day before, and which looks like a tiny Taj Mahal.

We pass over a small river, and our machine begins to wobble about in a very unpleasant manner. Captain Brancker puts his hand on top of mine on the control lever, and then we fly together for a while. Suddenly we see far away to the north a little cloud of dust. I push my foot to the left to alter our course towards it. As we get nearer and nearer I see distinctly on the ground below a track of wheels and horses. We follow it and it leads us to Chickaltana, which, from our point of observation, looks like a toy village. Quite distinctly now I see the rearguard of the retreating forces, then a long line of bullock carts—at least 150—these we pass over, then a battery of horse gunners. It all looks like delightful little playthings for dolls. Captain Brancker is writing all the time now. Could it be that he is making his will!—it is only his second trip, and he may well dislike the way the Bristol is now fighting with the bumps. Now we see plainly an infantry brigade deployed and facing west. Still we go on east to Karmad, just far enough to see the advance guard still moving East. Perhaps then the brigade was only deployed at Chickaltana to deceive us, anyway we are here to observe and not to draw conclusions. We circle a couple times over the troops, wave good-bye to them for fun, and fly back to the troops for whom we are working.

We are very fast now with the wind behind. It is quite amusing to watch our shadow sweeping along the ground at great speed. Captain Brancker is now controlling the machine with me. It is really bumpy now, and I feel quite relieved when I see in the distance the white towers of the Mosque. At the same moment we see two squadrons of Native

Lancers. I glide down in order to land; suddenly Captain Brancker shrieks in my ear to ascend again, as those are Poona horse and belong to the other party, and seem to be in a great hurry, as they are galloping full out.

We then pass over a screen of trees and land safely in a kind of discarded polo ground, not very far from the advance party of our army. Captain Brancker was highly delighted both with his flight and success of his mission. 'I have had the time of my life' were his first words when he came again to his feet.

The following day, when starting for Jalna, some forty miles away, our engine refused to work well as we had exhausted our supply of petrol and were then using some dirty red stuff bought in an Hindu Bazaar. Still, we attempted to start, left the ground tail down, lost flying speed when trying to clear a tree, and crashed to the ground. We were both flung out, none the worse for it. My companion had scratched his face, but his eye-glass was intact. He is most plucky, for he is arranging to come up with me again, directly the second machine is erected.

IV

ORDER OF BATTLE OF THE ROYAL FLYING CORPS ON 1ST JULY 1916 (SOMME)

General Officer Commanding: MAJOR-GENERAL H. M. TRENCHARD, C.B., D.S.O., A.D.C.

ST. ANDRÉ-AUX-BOIS (Advanced Headquarters: FIENVILLERS)

Ninth (Hq.) Wing

(Lieut.-Col. H. C. T. Dowding)

FIENVILLERS

No. 21 Squadron
(Maj. J. R. Campbell-Heathcote)
FIENVILLERS

14 R.E.7
4 B.E.2c
1 B.E.2E

No. 27 Squadron
(Maj. A. E. Borton, D.S.O.)
FIENVILLERS

17 Martinsyde
Scout

No. 60 Squadron
(Maj. F. F. Waldron)
VERT GALAND

4 Morane Biplane
9 Morane Scout

No. 70 Squadron (two Flights)
(Maj. G. A. K. Lawrence, D.S.O.)
FIENVILLERS

8 Sopwith two-seater
(4 of these did not arrive from
the depot until 3rd July)

I BRIGADE

(Brigadier-General D. le G. Pitcher)

CHÂTEAU WERPPE, 1 m. NE. of CHOCOQUES

First (Corps) Wing

(Lieut.-Col. J. H. W. Becke)

BETHUNE

No. 2 Squadron
(Maj. R. A. Cooper)

HESDIGNEUL
10 B.E.2c
8 B.E.2D

No. 10 Squadron
(Maj. W. G. S. Mitchell)

CHOCOQUES
11 B.E.2c
1 B.E.2D
1 B.E.12

No. 18 Squadron
(Maj. G. I. Carmichael,
D.S.O.)

BRUAY
12 F.E.2B

No. 3 K.B. Squadron
(Maj. P. K. Wise)

BETHUNE
Nos. 8 and 10 K.B.
Sections

No. 25 Squadron
(Maj. R. G. Cherry) (Maj. L. W. B. Ree.
No. 32 Squadron

LOZINGHEM
17 F.E.2B
1 F.E.2C
TREIZENNES
12 D.H.2

Tenth (Army) Wing

(Lieut.-Col. P. L. W. Herbert)

NORRENT-FONTES

First Army Aircraft Park (Maj. G. C. Ross-Mumby)—AIRE

II BRIGADE

(Brigadier-General T. I. Webb-Bowen)

OXELAERE

Second (Corps) Wing
(Lieut.-Col. C. A. H. Longcroft)

BECKE

<i>No. 1 Squadron</i> (Maj. G. F. Pretzman, D.S.O.)	<i>No. 5 Squadron</i> (Maj. R. M. Vaughan)	<i>No. 6 Squadron</i> (Maj. R. P. Mills)	<i>No. 7 Squadron</i> (Maj. F. J. L. Cogan)	<i>No. 16 Squadron</i> (Maj. D. W. Powell)	<i>No. 2 K.B. Squadron</i> (Maj. W. F. MacNeece)	<i>No. 20 Squadron</i> (Maj. G. J. Malcolm)	<i>No. 29 Squadron</i> (Maj. E. L. Conran)
BAILLEUL	DROGLANDT	ABEELE	BAILLEUL	LA GORGUE	MONT ROUGE	CLAIRMARAIS	ABEELE
8 Morane Parasol	10 B.E.2C	11 B.E.2C	8 B.E.2C	11 B.E.2C	Nos. 2 and 9 K.B. Sections	13 F.E.2D	15 D.H.2
5 Morane Biplane	2 B.E.2D	7 B.E.2D	4 B.E.2D	2 B.E.2D			2 F.E.8
3 Nieuport Scout							
2 Nieuport 2-seater							

Second Army Aircraft Park (Major D. G. Conner)—HAZEBROUCK

Eleventh (Army) Wing
(Lieut.-Col. F. W. Richey)
NIEPPE

III BRIGADE

(Brigadier-General J. F. A. Higgins, D.S.O.)

CHÂTEAU DE SAINS

Twelfth (Corps) Wing
(Lieut.-Col. G. S. Shephard)

AVESNES

<i>No. 8 Squadron</i> (Maj. P. H. L. Playfair)	<i>No. 12 Squadron</i> (Maj. J. C. Halahan)	<i>No. 13 Squadron</i> (Maj. E. W. Powell)	<i>No. 4 K.B. Squadron</i> (Maj. F. H. Cleaver)	<i>No. 11 Squadron</i> (Maj. T. O'B. Hubbard)	<i>No. 23 Squadron</i> (Maj. A. Ross-Hum)
BELLEVEUE	AVESNES-LE-COMTE	SAVY	BARLY	SAVY	LE HAMEAU
14 B.E.2C	14 B.E.2C	12 B.E.2C	Nos. 5 and 7 K.B. Sections	8 F.E.3B	14 F.E.2B
4 B.E.2D				4 Vickers Fighter	3 Martinsyde
				3 Bristol Scout	Scout
				3 Nieuport Scout	

Thirteenth (Army) Wing
(Lieut.-Col. C. F. de S. Murphy)
FOUFFLIN-RICAMETZ

Third Army Aircraft Park (Major F. H. Kirby, V.C.)—PRÉVENT

IV BRIGADE

(Brigadier-General E. B. Ashmore, C.M.G., M.V.O.)

LES ALENÇON.

Third (Corps) Wing

(Lieut.-Col. E. R. Ludlow-Hewitt, M.C.)

BERTANGLES

No. 3 Squadron
(Maj. H. D.
Harvey-Kelly,
D.S.O.)

LAHOUSOYE
12 Morane Parasol
4 Morane Biplane

No. 4 Squadron
(Maj. T. W. C.
Carthew,
D.S.O.)

BAIZEUX
17 B.E.2C
1 B.E.2D

No. 9 Squadron
(Maj. A. B.
Burdett)

ALLONVILLE
18 B.E.2C

No. 15 Squadron
(Maj. H. le M.
Brock, D.S.O.)

MARIEUX
16 B.E.2C

No. 1 K.B. Squadron
(Maj. C. Bovill)

CONTAY
Nos. 1, 3, 11, 12 and
14 K.B. Sections. Ad-
ditional Balloon specially
attached for tactical duty
4, 6 and 13 K.B. Sections
(Major H. R. Hunt).

No. 24 Squadron
(Maj. L. G.
Hawker,
V.C., D.S.O.)

BERTANGLES
19 D.H.2.
3 Bristol Scout¹
2 Morane Scout¹

No. 22 Squadron
(Maj. R. B.
Martyn)

BERTANGLES
18 F.E.2B

Fourteenth (Army) Wing
(Lieut. Col. C. G. Hoare)

BERTANGLES

¹ Attached from the squadrons of Third (Corps) Wing.*Fourth Army Aircraft Park* (Major A. Fletcher)—BEAUVAL

No. 1 *Aircraft Depot* (Maj. A. Huggins)—ST. OMER (127 aero-
planes, including unserviceable). *Engine Repair Shops* (Maj. G. B. Hynes)—PONT DE L'ARCHF,
ROUEN.

No. 2 *Aircraft Depot* (Maj. R. C. Donaldson-Hudson)—CANDAS *R.F.C. Port Depot* (2nd Lieut. J. M. Patten)—BOULOGNE.

Strength:

27 Squadrons
421 Aeroplanes
(Additional, 216 Aeroplanes at Aircraft Depots.)
4 Kite Balloon Squadrons
14 Balloons

V CHRONOLOGY

- 1884 Formation of balloon unit attached to Royal Engineers—took part in the Bechuanaland Expedition.
- 1892 Balloon depot and factory formed in 1883, permanently established at Aldershot.
- 1894 Balloon factory established at South Farnborough.
- 1901 Aero Club of the United Kingdom founded by F. S. Hedges Butler assisted by the Hon. C. S. Rolls.
- 1906 Lt.-Col. J. E. Capper, R.E., became superintendent of the balloon factory at Farnborough
Col. S. F. Cody made experimental flights over Laffans Plain.
- 1907
 5 October First successful flight of the Army Airship *Nulli Secundus* over London.
- 1908
 8 June Mr. Alliott Verdon-Roe, first Englishman to fly an all-British built aeroplane.
- 1909
 30 November The Aero Club flying ground established at Eastchurch.
 May Messrs. Vickers, Son & Maxim commenced building a naval rigid airship known as the *Mayfly*, at Barrow-in-Furness.
 30 October J. T. C. Moore-Brabazon flew first circular mile ever covered by a British aeroplane.
- 1910
 8 March First aviator's certificate of the Royal Aero Club of the United Kingdom granted to J. T. C. Moore-Brabazon.
 3 June The *Beta* airship flew from Farnborough to London and back by night—a distance of 70 miles in just over 4 hours.
 12 July Hon. C. S. Rolls lost his life while flying a Wright biplane at aviation 'meeting' at Bournemouth.
- 1911
 2 March Four Naval Officers began first course of flying at Eastchurch.
 1 April Air Battalion of Royal Engineers formed at Larkhill.
 24 September Naval Airship No. 1 (*Mayfly*) wrecked.
 December Establishment of the first naval flying school at Eastchurch.
 Lt. C. R. Samson, R.N., made the first successful flight from the deck of a British warship H.M.S. *Africa*.

1912

- March Mr. Horace Short produced the first successful seaplane in England.
- 13 May The Royal Flying Corps formed by Royal Warrant dated 13 April 1912.
Nos. 1, 2, and 3 Squadrons formed, No 4 formed September 1912, No. 5 formed August 1913, No. 6 formed January 1914, and No. 7 May 1914.
- 19 June Central Flying School opened at Upavon Downs, with Captain Godfrey Paine, R.N., as the first Commandant.
- 5 July First flying casualties of the Royal Flying Corps, Capt. E. B. Loraine and Staff-Sgt. R. H. V. Wilson killed in a Nieuport monoplane.
- October Decision by Admiralty to establish a chain of air stations along the coast within flying distance of each other.

1913

- March Formation of Experimental Branch of the Military Wing of the Royal Flying Corps under the command of Major Herbert Musgrave.
- July During Naval manœuvres two seaplanes were successfully flown off the launching platform of H.M.S. *Hermes*.
- 7 August Col. S. F. Cody killed by the breaking of his machine over Laffans Plain.
- 22 November Record long-distance flight of 445 miles made by Capt. C. A. H. Longcroft of No. 2 Squadron, R.F.C.

1914

- 1 July Naval Wing of the Royal Flying Corps became the Royal Naval Air Service.
- 18-22 July Royal Naval Air Service took part in the review of the Fleet and manœuvres at Spithead.
- 4 August Outbreak of war.
- 8 August First air-raid alarm in England (Eastchurch area).
- 10 August Patrol of Straits by Naval airships during passage of Expeditionary Force.
- 13-15 August Royal Flying Corps Squadrons flew to France for service with the B.E.F.
- 19 August First air reconnaissance of the war made by Capt. Joubert de la Ferté and Lt. G. W. Mapplebeck.
- 22 August First Royal Flying Corps casualty caused by enemy action (Sergt.-Major Jillings, observer, wounded in the leg).
First British aircraft to be shot down in War.
- 23 August Battle of Mons opened.
- 25 August First enemy aircraft shot down in air combat.
- 27 August Eastchurch Squadron moved to Belgium under command of Commander Samson, R.N.

1914

- September Wireless machines of No. 4 Squadron first used to observe artillery fire. Battle of the Aisne.
- 6 September Battle of the Marne opened.
- 7 September By this date the Royal Flying Corps had destroyed 5 enemy aeroplanes.
- 22 September First British air raid on airship bases in Germany—Dusseldorf and Cologne.
- 28 September German aircraft adopt distinctive national marking.
- 8 October First German Zeppelin to be destroyed (in its shed at Dusseldorf by Naval aeroplanes).
- 31 October Seaplane carrier H.M.S. *Hermes* sunk in the Channel.
- 12 November Orders issued for all British aeroplanes on Western Front to bear national marking.
- 21 November Successful air attack on Zeppelin base at Friedrichshafen.
- 24 November *Konigsberg* discovered in the Rufiji Delta by flying-boat flown by Flight Sub-Lieutenant H. D. Cutler.
- 21 December First aeroplane raid on England.
- 24 December Second aeroplane raid on England. First bombs dropped on English soil.
- 25 December Attack on airship sheds at Cuxhaven by seaplanes.

1915

- January First successful photographic reconnaissance (La Bassée Canal)
Clock Code System of artillery ranging from the air instituted.
- 19–20 January First air raid on Great Britain by Zeppelin airship.
- 10 March Attack on Neuve Chapelle opened.
- 15 March First merchant ship attacked from the air.
- 23 March First kite-balloon ship commissioned (H.M.S. *Manica*).
- 22 April First enemy gas attack. Second Battle of Ypres.
- 26 April Action for which first Victoria Cross was awarded for gallantry in the air.
- 7 May Sinking of the *Lusitania* with the loss of 1,198 lives.
- 31 May First Zeppelin raid on London (LZ.38).
- 7 June Destruction of first German Zeppelin (LZ.37) in the air by Flight Sub-Lieutenant R. A. J. Warneford.
German Zeppelin LZ.38 destroyed in shed at Evere.
- 11 July Destruction of the German Cruiser *Konigsberg* in the Rufiji Delta by indirect fire from monitors *Severn* and *Mersey* ranged by Naval aeroplanes.
- 12 August First enemy ship sunk by torpedo from British seaplane (Dardanelles).
- 19 August Colonel H. M. Trenchard took over command of Royal Flying Corps in France from Brigadier-General Sir David Henderson.

1915

- 8/9 September First H.E. bombs fell on London from German Zeppelin L.Z.13, killing 32 persons and injuring 87.
- 1 October Beginning of period in which the Germans obtained temporary superiority in the air on the Western Front (due to the Fokker monoplane).
- 13 October East Coast of England and London raided by airships.

1916

- January Formation flying introduced.
- 15 February Joint War Air Committee established—disbanded two months later.
- 16 February War Office take over from Admiralty the anti-aircraft defence of Great Britain.
Lord French, C.-in-C. Home Forces, placed in charge of Air Defence of Great Britain.
- March Royal Flying Corps operations in Northern Waziristan.
- 14 April Constantinople and Adrianople bombed by Royal Naval Air Service aeroplanes from Mudros.
- 15 April First use of aircraft for delivering food and supplies to beleaguered garrison at Kut-el-Amara.
- 11 May First Air Board constituted, under presidency of Lord Curzon; first meeting 22 May.
- 31 May Battle of Jutland. First air co-operation in Naval action.
- 1 July Battle of the Somme opened. Contact patrols first instituted.
Royal Flying Corps established ascendancy in the air.
- 30 July First aerial operations carried out by combined British and French air services on the French front.
- 2/3 September First German airship shot down over Great Britain by aeroplane.
- 15 September Battle of Flers-Courcelette begins. First aerial co-operation with tanks.
- 1 October German airship L.31 destroyed by aeroplanes at Potters Bar, near London.
- 28 November First German daylight aeroplane raid on London.
- 12 December Army Council approved expansion of Royal Flying Corps Squadrons to one hundred and six active squadrons and ninety-five reserve squadrons. Later two night-flying squadrons were added.

1917

- 9 January Seaplane carrier *Ben-my-Chree* sunk off Kastelorizo, Asia Minor.
- 24 January Responsibility of aircraft supplies transferred to Ministry of Munitions.
- 1 February Germany opened unrestricted U-boat warfare.

1917	
6 February	Second Air Board constituted under Lord Cowdray.
9 April	Battle of Arras opened.
7 May	First night aeroplane raid on London. Captain Albert Ball killed.
14 May	German airship L.22 destroyed in the North Sea by British seaplane.
20 May	First U-boat sunk by aircraft in North Sea.
25 May	First large-scale aeroplane raid on England to cause heavy casualties.
7 June	Battle of Messines opened. Organized use of aircraft in low flying attacks on ground targets.
13 June	First large-scale daylight attack by German aircraft on London.
21 June	War Office recommended that the Royal Flying Corps be expanded from 108 squadrons to 200.
28 June	General Sir E. H. H. Allenby appointed to Command the Egyptian Expeditionary Force.
July	Winston Churchill became Minister of Munitions.
11 July	Lieutenant-General J. C. Smuts appointed to Cabinet Committee on Air Defence and Air Organization.
19 July	Lieutenant-General J. C. Smuts issued his report on the defence of London against air attack.
21 July	Air Raid warnings (maroons) introduced in London.
31 July	Opening of Allied offensive in Flanders.
2 August	Sopwith Pup aeroplane landed successfully on the deck of the aircraft carrier <i>Furious</i> by Squadron Commander E. H. Dunning.
5 August	Brigadier-General E. B. Ashmore placed in Command of London Air Defence area.
17 August	Lieutenant-General J. C. Smuts submitted his proposals to the War Cabinet for the creation of a separate Air Force.
21 August	Zeppelin destroyed off the coast of Denmark by aircraft from H.M.S. <i>Yarmouth</i> .
22 August	Last German aeroplane raid on England by daylight in 1914-1918 war.
24 August	Formation of Air Organization Committee under Brigadier-General Sir David Henderson.
2 September	First severe German aeroplane raid on England by moonlight.
21 September	Formation of Aerial Operations Committee—Lieutenant-General J. C. Smuts chairman (later named War Priorities Committee).
1 October	Aircraft flown from gun turret launching gear on H.M.S. <i>Repulse</i> .
5 October	Formation of the Palestine Brigade of the Royal Flying Corps.

- 1917
- 11 October Creation of a bombing formation (41st Wing) for the attack of industrial targets in Germany.
 - 20 November Battle of Cambrai opened. Development of low flying attacks by fighter aircraft on ground targets.
 - 29 November Air Force (Constitution) Act received Royal assent.
- 1918
- 2 January Air Ministry formed.
Order in Council issued defining composition and duties of the Air Council.
 - 3 January Lord Rothermere became the first Secretary of State for the Air Force. Major-General Sir Hugh Trenchard, first Chief of Air Staff.
The Air Council take over functions of the Air Board.
 - 18 January Major-General Sir J. M. Salmond succeeded Major-General Sir Hugh Trenchard in command of Royal Flying Corps in France.
 - 1 February Formation of VIII Brigade for independent bombing of Germany.
 - 7 March First German aeroplane raid on London on a moonless night.
 - 21 March Germany opened offensive on Western Front.
 - 26 March Inter-Allied Conference at Doullens which led to the appointment of Marshal Foch as Generalissimo.
 - 1 April Royal Flying Corps and Royal Naval Air Service amalgamated as the Royal Air Force.
Women's Royal Air Force formed.
 - 12 April Last German airship raid over England in which casualties were inflicted.
Field-Marshal Sir Douglas Haig issued the 'Backs to the Wall' Order of the Day.
Six enemy aircraft destroyed in one day by a single R.A.F. pilot.
 - 14 April Major-General F. H. Sykes appointed Chief of Air Staff.
 - 21 April Freiherr Manfred von Richthofen shot down and killed by Captain A. R. Brown, No. 209 Squadron.
 - 27 April Sir William Weir became Secretary of State for the Royal Air Force.
 - 18-22 May German bombing attacks on British ammunition depots in France resulted in destruction of 12,500 tons of ammunition.
 - 19/20 May Attack by German Air Force on railway bridge at Etaples, casualties in military hospital, 182 killed and 643 wounded.
 - 19/20 May Last German aeroplane raid on England in which casualties were inflicted.

- 1918
- June Royal Air Force Nursing Service formed—became Princess Mary's Royal Air Force Nursing Service in June 1923.
 - 5 June Creation of the Independent Air Force for the strategic bombing of Germany under command of Major-General Trenchard.
 - 4 July R.A.F. dropped supplies of ammunition to troops engaged on the attack of Hamel.
 - 8 July Zeppelin base at Tondern attacked by Camel aeroplanes from the Aircraft Carrier *Furious*; Airships L.54 and L.60 destroyed.
 - 5 August Last Zeppelin raid on England; L.70 destroyed.
 - 11 August Zeppelin L.53 destroyed off Terschelling by Sopwith Camel flown from a towed lighter.
 - 11 August M/T Depot, Calais, destroyed by enemy aircraft action resulting in the loss of spare parts to the value of 1½ million pounds.
 - 21 August Battle of Bapaume.
 - 26 August Battle of the Scarpe.
 - 28 August Battle of the Somme (1918) opened.
 - 19 September Final campaign in Palestine opened.
 - 19/20 Sept. Destruction by air attack of the Turkish Seventh Army in Wadi el Far'a, Palestine.
 - 27 September Assault on the Hindenburg line began.
 - 30 September Armistice signed with Bulgaria.
 - 8 October Hindenburg line captured.
 - 18 October Lille captured.
 - 26 October Major-General Sir Hugh Trenchard assumed command of Inter-Allied Independent Air Force.
 - 30 October Armistice signed with Turkey.
 - 14 October Handley Page aircraft dropped the largest bomb used by the British Air Force during the war 1914-1918—weight 1,650 lb.
 - 4 November Victory of Vittorio Veneto.
 - 11 November Hostilities ceased. Armistice with Germany signed.
 - 29 November First flight from Cairo to India, made by Captain Ross Smith and two mechanics, began.
- 1919
- 11 January Major-General Sir Hugh Trenchard re-appointed Chief of Air Staff. Major-General Sir F. H. Sykes appointed Controller-General of Civil Aviation.
 - 12 February Winston Churchill became Secretary of State for War and Air.
 - March Inauguration of air mail service between Folkestone and Cologne for communication with army of occupation. Service discontinued in August 1919.
 - Spring Air operations in the Third Afghan War and in Waziristan.

1919

- May Operations against Sheik Mahmud.
14/15 June First direct non-stop flight across the Atlantic by aeroplane (Pilot, Captain John Alcock. Navigator, Lieutenant Arthur Whitten Brown).
July Introduction of Short Service Commissions in Royal Air Force
2-13 July Airship R.34 flew across Atlantic and back.
4 August Present ranks of R.A.F. brought into use.
11 November Paris-London air mail started.
12 November Captain Ross Smith and Lieutenant K. M. Smith left England on flight to Australia.
11 December White Paper on permanent organization of the Royal Air Force presented to Parliament by Winston Churchill.

1920

- January- Successful air co-operation with the Camel Corps
11 February against the Mullah in Somaliland.
5 February R.A.F. Cadet College opened at Cranwell.
3 July First R.A.F. 'Tournament (later known as the Pageant and subsequently R.A.F. Display, held at Hendon).
9 August Formation of the South African Air Force.

1921

- January R.A.F. Airships Service disbanded.
1 March Captain the Hon. F. E. Guest became Secretary of State for Air.
12-30 March Cairo Conference to examine administration of Mandated territory.
1 April Formation of the Royal Australian Air Force.
23 June Air route from Cairo to Baghdad opened operating an air mail service.
24 August Rigid airship R.38 broke up over Hull.

1922

- 1 April Formation of the Royal Canadian Air Force.
4 April R.A.F. Staff College opened at Andover.
September Air Operations in Kurdistan.
1 October Military control of Mesopotamia (Iraq) taken over by the Royal Air Force.
November Sir Samuel J. C. Hoare succeeded Hon. F. E. Guest as Secretary of State for Air.

1923

- 9 February Formation of the Reserve of Air Force Officers.
March R.A.F. action, against Sheik Mahmud, in Iraq.
25 June Statement by Prime Minister, Mr. Stanley Baldwin, in Parliament to the effect that 'British Air Power must include a Home Defence Air Force of sufficient strength adequately to protect us against air attack by the strongest air force within striking distance of this country'. Decision to raise the Home-based air force to 52 Squadrons.

- 1924**
 January Lord Thomson became Secretary of State for Air.
 April Creation of the Fleet Air Arm.
 9 October Order in Council establishing the Auxiliary Air Force.
 October Sir Samuel Hoare succeeded Lord Thomson as Secretary of State for Air.
- 1925**
 1 January Appointment of Air Officer Commanding in Chief Air Defence of Great Britain.
 22 October No. 1 Apprentices Wing formed at Halton.
 25 October Long-distance service flight from Cairo to Kano; Nigeria and back completed by 19 November. Three aircraft led by Squadron Leader A. Coningham.
- 1926**
 1 March-21 June Four aircraft flown from Cairo to the Cape and back and subsequently to England, under command of Wing Commander C. W. H. Pulford.
- 1927**
 1 January Imperial Defence College opened.
 26 September Schneider Trophy contest won by Flight Lieutenant A. M. Webster in a Supermarine S.5.
 17 October Flight led by Group Captain Cave-Brown-Cave left England for Singapore in four flying-boats.
- 1928**
 February Defence of Aden placed under the control of the Royal Air Force.
 23 December Royal Air Force evacuated women and children from Kabul during the Afghan rebellion of 1928-9.
- 1929**
 April Squadron Leader A. G. Jones-Williams and Flight Lieutenant N. H. Jenkins flew from Cranwell to Karachi non-stop.
 June Lord Thomson succeeded Sir Samuel Hoare as Secretary of State for Air.
 6/7 September Flying Officer H. R. D. Waghorn in Supermarine seaplane won Schneider Trophy contest.
- 1930**
 1 January Air Chief Marshal Sir John Salmond appointed Chief of Air Staff.
 August Flight to Canada and back by Airship R.100.
 4 October Loss of the Airship R. 101 on passage to India. Lord Thomson, Secretary of State for Air, was killed. He was succeeded by Lord Amulree.
- 1930-1931** Air action against tribal disorders in South Kurdistan instigated by Sheik Mahmud.

- 1931
 13 May Sheik Mahmud surrendered.
 29 September Royal Air Force won the Schneider Trophy outright. (Flight Lieutenant J. N. Boothman in Supermarine S.6).
 World air speed record of 407·5 m.p.h. set up by Flight Lieutenant G. H. Stainforth, R.A.F., in an S.6 seaplane.
 November Marquess of Londonderry became Secretary of State for Air.
- 1933
 6 February Squadron Leader O. R. Gayford and Flight Lieutenant G. E. Nicholetts flew from Cranwell to Walvis Bay, S.W. Africa—a distance of 5,340 miles in 57 hrs. 25 mins. without landing.
 1 April Formation of the Indian Air Force.
 3 April First flight over Everest.
 22 May Air Chief Marshal Sir Edward Ellington appointed Chief of Air Staff.
- 1934
 24 May First Empire Air Day Celebration in aid of the Royal Air Force Benevolent Fund.
 December London to Australia air route opened.
- 1935
 22 May Proposals laid before Parliament to raise first line aircraft to 1,500 by 1937.
 June Sir Philip Cunliffe-Lister (later Viscount Swinton) became Secretary of State for Air.
- 1936
 May Home Defence Force organized into four Commands, Bomber, Fighter, Coastal, and Training Commands.
 30 July Formation of Royal Air Force Volunteer Reserve.
- 1937
 1st April Formation of the Royal New Zealand Air Force.
 30 July Admiralty took over complete control of the Fleet Air Arm.
 August Air Chief Marshal Sir Cyril Newall succeeded Sir Edward Ellington as Chief of Air Staff.
- 1938
 10 February Squadron Leader Gillan flew from Edinburgh to Northolt in a Hawker Hurricane in 48 minutes.
 28 May Sir Kingsley Wood succeeded Viscount Swinton as Secretary of State for Air.
 September Munich crisis. Partial mobilization of R.A.F.
- 1939
 28 June Formation of Women's Auxiliary Air Force.
 3 September Great Britain declared war on Germany.
 Mobilization of the Royal Air Force and Dominions Air Forces.

Bibliography

- ARMSTRONG, H. C. *Grey Wolf*. 1937
 BARNETT, G. *V.C.s of the Air*. 1918
 BISHOP, W. *Winged Warfare*. 1918
 CHARLTON, L. E. O. *Deeds that Held the Empire. By Air*. 1940
 CHURCHILL, WINSTON *The World Crisis 1911-1914*. 6 vols. 1923-31. (1 vol. edn. 1931)
 DE LA BERE, R. *A History of the Royal Air Force College, Cranwell*. 1934
 EDMONDS, SIR JAMES *Military Operations in France and Belgium*. 1922-35
 FELLOWES, P. F. M. *First Over Everest*. 1934
 GAMBLE, C. F. SNOWDEN *The Air Weapon*. 1931
 GRAY, C. G. *A History of the Air Ministry*. 1940
 GROVES, P. R. C. *Behind the Smoke Screen*. 1934
 HAMMERTON, SIR J. *A.B.C. of the R.A.F.* 1942
 HANSARD *Parliamentary Debates*. 1911; 1917-1939
 HART, LIDDELL *When Britain Goes to War*. 1935
 JONES, IRA *King of Air Fighters*. 1934
 KEITH, C. HILTON *Flying Years*. 1937
 KIERNAN, R. H. *Captain Albert Ball*. 1933
 LAWRENCE, T. E. *Revolt in the Desert*. 1927
 LEWIS, CECIL *Sagittarius Rising*. 1936
 LLOYD GEORGE, DAVID *War Memoirs*. 6 vols. 1933-6. (2 vol. edn. 1938)
 LONDONDERRY, LORD *Wings of Destiny*. 1943
 MCCUDDEN, J. B., V.C. *Five Years in the R.F.C.* 1919
 MACMILLAN, N. *The R.A.F. in the World War*. Vols. 1-1942-
 RALEIGH, SIR WALTER, and JONES, H. A. *The War in the Air*. 6 vols. 1922-37
 RICHTHOFEN, M. VON *Red Air Fighter*. 1918
 SHEPHEARD, E. C. *The Air Force of To-Day*. 1929
 SLESSOR, J. C. *Air Power and Armies*. 1936
 SMITH, SIR ROSS *14,000 Miles Through the Air*. 1922
 STAINFORTH, G. H. *The Book of Speed*. 1934
 SYKES, SIR F. H. *From Many Angles*. 1942
 TEMPERLEY, A. C. *The Whispering Gallery of Europe*. 1938
 THOMSON, LORD *Air Facts and Problems*. 1927
 TURNER, C. C. *The Struggle in the Air 1914-1918*. 1919
 VERDON-ROE, SIR A. *The World of Wings and Things*. 1919
 'VIGILANT' *German War Birds*. 1931

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